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# THE MILITARY SURGEON

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## NOTES ON THE HISTORY OF MILITARY MEDICINE

(Continued from December, 1921)

By LIEUT. COLONEL FIELDING H. GARRISON

*Medical Corps, United States Army*

ROME

(Republic and Empire)

IN A DELIGHTFUL little book, issued by the London Society for Promoting Christian Knowledge,<sup>1</sup> Flinders Petrie cautions historical students against our common human tendency to condemn or cry down a given thing because Nature made it what it is and not something else:

When we try to estimate the condition of historic periods we must not lay too much stress on unaccustomed features. The Egyptian kings of the XVIIIth dynasty have been absurdly compared to Mtesa, because they maltreated their enemies. Rather we should class them above Louis XIVth, who infamously tortured his most faithful subjects if they differed from him in religion. We must avoid trusting our judgment too exclusively either on moral or on artistic grounds—both have their place in judging of a civilisation. We must not refuse our admiration for the “best and greatest” of Emperors, Trajan, because his life was such that he would be sent to penal servitude in these days. . . . Similarly, on the other hand, we must not depreciate the moral grandeur of Isaiah or Amos because the sculpture of that age is trivial and its pottery ugly. Nor must we depreciate Greek art and philosophy because their politics were shortsighted and amenable to Persian gold. Each civilisation has to be adapted to its own conditions, and by its success in those conditions, and the benefits it has bequeathed to mankind, it must be judged by posterity.

In considering the Romans, an essentially military nation, one should endeavor to see this great people also “with the equal eye of Nature.” The systematic depreciation of Caesar, Augustus and the better sort of emperors, by Wells (as socialistic propaganda), may be taken *cum grano salis*, like the laborious whitewashing of Henry VIII by Froude (for theological reasons), or of Tiberius Caesar by Ferrero (for reasons known only to himself). There are two great social forces which have been in continual conflict since the Roman period, one defined by Roosevelt as “centrifugal,” as seeking individual freedom and independence at the expense of stable, centralized government; the other

<sup>1</sup> W. M. Flinders Petrie: *Some Sources of Human History*. London, 1919, 22

"centripetal," seeking a rigid, stable social order at the expense of personal liberty.<sup>2</sup> The logical term and end of the one is anarchy; of the other, tyranny. In adjusting the merits of either, the exquisite judgment of Theodor Mommsen remains unassailable for equity and fairness, even though his argument now reads like a veiled defense of Prussian policy:

It is only a pitiful narrow-mindedness that will object to the Athenian that he did not know how to mould his state like the Fabii and the Valerii, or to the Roman that he did not learn to carve like Phidias and to write like Aristophanes. It was in fact the most peculiar and the best feature in the character of the Greek people that rendered it impossible for them to advance from national to political unity without at the same time exchanging their polity for despotism. The ideal world of beauty was all in all to the Greeks, and compensated them to some extent for what they wanted in reality. Wherever in Hellas a tendency towards national union appeared, it was based not on elements directly political, but on games and art: the contests at Olympia, the poems of Homer, the tragedies of Euripides, were the only bonds that held Hellas together. Resolutely, on the other hand, the Italian surrendered all arbitrary aspiration toward freedom, and learned to obey his father that he might know how to obey the state. Amidst this subjection individual development might be marred, and the germs of fairest promise in man might be arrested in the bud, the Italian gained in their stead a feeling of fatherland and of patriotism such as the Greek never knew, and alone among all the civilized nations of antiquity succeeded in working out national unity in connection with a constitution based on self-government—a national unity, which at last placed in his hands the mastery not only over the divided Hellenic stock, but over the whole known world.<sup>3</sup>

The Romans, compounded of an ascendant Northern strain (Umbrian and Sabine), an Oriental strain (Etruscan), an autochthonous, neolithic strain (Ligurian), and (in Southern Italy) of an independent group of Hellenic colonials (Magna Graecia), were more diverse and stranger in their ethnic plies than the Greeks; but the "close-fisted Umbrian," the "sombre Puritanical Sabine" and the "obese Etruscan" were all of a piece in warlike disposition, in hard and exclusive caste feeling, in dogged, obstinate perseverance, in rustic austerity of demeanor and morals and "by their fusion Rome was created" (Allbutt)<sup>4</sup> The dominating Latin stock was thus rustic, tight fisted, hard bargaining, like all tillers

<sup>2</sup> Why do great artificial empires, whose citizens are knit by a common bond of speech and culture much more than by a bond of blood, show periods of extraordinary growth, and again of sudden or lingering decay? In some cases we can answer readily enough; in other cases we cannot as yet even guess what the proper answer should be. If in any such case the centrifugal forces overcome the centripetal, the nation will of course fly to pieces." Theodore Roosevelt: *Biological Analogies in History*, New York, Oxford Univ. Press, 1910, 23.

<sup>3</sup> Mommsen: *History of Rome*, N. Y., 1879, I, 55.

<sup>4</sup> Allbutt: *Greek Medicine in Rome*, 14 notes the shrewd differentiation of these ethnic strains by the poet Catullus: 33-36 B.C. 1. "Si urbanus esses aut Sabinus aut Tiburs

Aut parens Ueber aut obesus Etruscus

Aut Lanuvinus ater atque dentatus, etc. (XXXIX, 10-12), and elsewhere the "telus et tractus Sabinorum disciplin."

of the soil<sup>5</sup>, "more superstitious than religious," yet canny rather than narrow-minded, with little or no artistic feeling, and no medicine except folk- or domestic medicine. The slow climb to the highly artificial civilization of the Empire (with its wonderfully organized army and medical corps as the backbone of the state) was a long process of trial and error, "always more remarkable," as Mommsen says, "for tenacity, cunning and consistency than for grandeur of conception or power of rapid organization." Time and again the Romans failed in battle, as in the egregious blunders of the Punic Wars, but in the end the very name "Roman" came to imply rugged fortitude and contempt for disaster, invincible morale, dogged tenacity of purpose and unbeatable persistency of effort. "The Hellenes," says Mommsen, "sacrificed the whole to its individual elements, the nation to the township, and the township to the citizen." The Romans, on the other hand, "bade the son to reverence the father, the citizen to reverence the ruler, and all to reverence the gods; required nothing and honored nothing but the useful action; compelled every citizen to fill up every moment of his brief life with incessant work; condemned every citizen who wished to be different from his fellows; regarded the state as all in all and a desire for the state's extension as the only aspiration not liable to censure" (II, 48). The Roman gods, were not, as with the Greeks,

"The intelligible forms of ancient poets,  
The fair humanities of old religion,"<sup>6</sup>

but metaphysical abstractions applied to every object or event in life (plowing, child-birth, scabies, malarial fever, etc.). The Roman conception of religion (*religio*), was, as with the Hebrews, "that which binds." In Allbutt's view, "Rome starved individual religion by identifying it with the state and by using it as a buttress to the imperial power."<sup>7</sup>

In the citizen army of republican Rome, there were no medical arrangements for the care of the sick and wounded, beyond the ordinary wound-dressing we have seen in the *Iliad*. Early Rome was mainly an agricultural community, with no provisions for medicine, beyond such skill in domestic and veterinary medicine as every citizen, as house-father, was expected to have and to practise. In the days of the Empire, Greek medicine had become firmly established in Rome, and the imperial armies acquired a well-organized medical establishment, the first and the best in antiquity.

<sup>5</sup> Some of the bravest and ablest of the earlier Roman commanders, e.g., Marcus Furius Camillus, Marcus Curius Dentatus and L. Quintus Cincinnatus, went straight from the plow to the field of battle.

<sup>6</sup> Schiller: *Wallenstein* (Coleridge's translation).

<sup>7</sup> Sir T. C. Allbutt: *Greek Medicine in Rome*, London, 1921, 21

*Organization of the Roman Army under the Republics*

The Roman Army began with the foundation of Rome (753 B.C.) and for centuries was made up of organized militia, i.e., of levies of citizens. The army of Romulus consisted of 300 light cavalrymen (*celeræ*), and 3,000 infantry (*milites*), to which each of the three tribes contributed a third, commanded by their own tribunes. These soldiers provided their own arms and armour, served without pay, as a patriotic privilege, and were drawn mainly from the better classes of society. Under the king Servius Tullius (578-534 B.C.), the so-called Servian constitution went into effect, reorganizing the whole fabric of Roman society along military lines. Every household, even the manumitted slave who held property, was made liable to military service between the ages of 17 and 60, with the sensible regulation that those between 17 and 46 served in the field, those between 47 and 60 within the walls of the city. The *centuriæ* of cavalry were increased six-fold (1,800); each legion of infantry now consisted of 4,200 men, of whom 3,000 were the original heavy infantry (*hoplites*) of Romulus, and 1,200 light infantry (*velites*), who, in later times, were usually commandeered to evacuate the wounded after battles. The selection of this army was apportioned among four districts of the state, according to the findings of the census, which was instituted by Servius for the sole purpose of ascertaining the military man-power of Rome.

During the early period when the Romans, beleaguered by enemies, had to fight for their very existence, the battle organization was the old Grecian phalanx, a solid front of 500 men, six files deep. The troops in the rear files were protected by man-sized shields (*clypeæ*), which proved very useful in covering or bearing wounded comrades. As the Roman nation advanced from a policy of self-defence and self-determination to the necessary assimilation of the whole peninsula of Italy, an army of conquest was developed, the main advantages of which were a system of pay and long service, so that even the poorer classes who owned no property (*capite censi*) were privileged to serve. These changes were instituted about the time of the siege of Veii (396 B.C.) and are attributed to Marcus Furius Camillus. Camillus substituted for the old phalanx formation a three-line arrangement by maniples, a flexible chess-board formation in open order (3 x 10), which threw the responsibilities of initiative upon each isolated unit and each individual man. In this arrangement, the front row (*hastati*) bore the brunt of battle, the second row (*principes*) passing through the intervals and taking the front line if the *hastati* gave out, while the third row (*triarii*) remained kneeling behind their shields, closing up the intervals and participating in a general assault only when the whole line wavered. It was through this battle formation that Roman valor won its distinctive laurels in the days of the Republic. The main defect of the Roman Army in this early period was that appointments to commands were temporary and political. As every Roman citizen had military training, the two consuls became *ex officio* commanders-in-chief of the army, with the result that no individual military policy could be permanent. Commands as well as commanders were influenced by the programs of political parties and the vacillation, hesitation, and dread of responsibility, which go along with temporary or precarious tenure of office, were everywhere apparent.<sup>8</sup>

<sup>8</sup> The best and most thoroughgoing account of the administration of the Roman Army, including its medical arrangements under the Empire, is that of Joachim Marquardt in Marquardt & Mommsen: *Handbuch der römischen Alterthümer*, 2. Aufl. Leipzig, 1884, v (Römische Staatsverwaltung, II, pt. 3, Das Militärwesen), 317-612.

<sup>9</sup> See Capt. C. F. Atkinson: *Encyclop. Britan.*, Cambridge, 1910, II, 595. Mommsen discusses this matter in his *History*, particularly in his account of the masterly inactivities ("Fabian policy") of Quintus Fabius Maximus (II, 148-153).



*Status of Military Medicine under the Roman Republic*

Before the ascendancy of Julius Caesar (54-44 B.C.), who gave to physicians the right of citizenship, medicine, as practiced by the Greeks, was despised in Rome, and military medicine was non-existent. Greek physicians were scorned, as taking fees, and feared, as possible poisoners. Roman medicine was domestic and herbal medicine, with knowledge of a few hæmostatic remedies<sup>10</sup> and the usual accompaniment of superstitious observances related to the household gods. Cato the Censor boasted that ancient Rome was "without physicians, but not without medicine" (*sine medicis sed non sine medicina*) and treated every ailment, even wounds, with the cabbage. Pliny the Elder (23-79 A.D.), in the days of the Empire, voices the ancient clan-prejudice against the ways of the foreigner:

For some trifling sore or other, a medicament is prescribed from the shores of the Red Sea; while not a day passes but what the real remedies are to be found upon the tables of the very poorest among us. But if the remedies for diseases were derived from our own gardens, if the plants or shrubs were employed which grow there, there would be no art, forsooth, which would rank lower than that of medicine. Yes, avow it we must—the Roman people, in extending its empire, has lost sight of the ancient manners, and we the conquerors are conquered; for now we obey the natives of foreign lands, who by the agency of a single art have outgeneralled our generals. (Natural History, XXIV, 1.)

When wounded, the Roman soldier, in this early period, was bandaged either by himself or by his comrades, presumably with materials carried about his person. That the art of bandaging was as well known to the early Romans as to the ancient Egyptians is apparent from Livy's account of the assassination of Tarquin (616 B.C.), when Tanaquil, his wife, "sedulously prepares everything necessary for dressing the wound" and later assures the people that "the wound had been examined, the blood wiped off, that all the symptoms were favorable."<sup>11</sup> An instance of many soldiers bandaging themselves and feigning wounds to avoid service under an unpopular leader, Appius Claudius (469 B.C.) is on record.<sup>12</sup> The pathetic image of the Dying Gaul (Capitoline Museum, Rome) suggests, however, the fate of the luckless, whether Roman or barbarian. If abandoned or left in the lurch, the wounded soldier could do little but crawl to shelter and die. But the Romans of the Republic had a kind of family interest in their citizen army, recruited from the people without pay, and stood by it in the hour of need. Thus, Tacitus, in describing the caving in of the amphitheater of Fidenæ in the reign of

<sup>10</sup> Medicina quondam fuit paucarum scientia herbarum, quibus sisteretur fluxus sanguis, vulnera coirent. Seneca: Ad Lucilium, lib. XV, 8, ep. 3, 95. Cited by Haberland.

<sup>11</sup> Inspectum vulnus absterso cruore, omnia salubria esse. Livy I, 41.

<sup>12</sup> Dionysius Halicarnassensis: Antiquitates Romanorum, IX, 50.

Tiberius (27 A.D.), refers to the solicitude of the populace for the 50,000 killed and injured, as follows:

The city of Rome recalled in that time of mourning an image of ancient manners, when after a battle bravely fought, the sick and wounded were received with open arms and relieved by the generosity of their country.<sup>12</sup>

In the Roman History of Livy, which shadows forth the underlying principles of administration for evacuation of the wounded, as we now know it, one can trace, chapter by chapter, the gradual evolution of the two fundamental concepts, viz.: (1) care of the wounded as a military necessity and patriotic duty; (2) demoralization of the fighting line by the misery of the wounded, when the primal duty of evacuation is neglected.

Thus, as early as 502 B.C., we find that it was customary for the Roman armies to take their wounded with them after a battle, to remain with them until they were in condition to be moved or to leave them in a safe place:

502 B.C. (A.F.C. 252). "The consul was left among many more who were wounded, with very uncertain hopes of his recovery. After a short time, sufficient for curing their wounds and recruiting their army, they marched against Pomertia with redoubled fury and augmented strength." (II, 17).

"421 B.C. (Volscian Wars): "Taking with him all the wounded he could, and not knowing what route the consul had taken, he (Tempanius) proceeds by the shortest roads to the city" (IV, 39).

Later on, billeting or cantonment hospitalization was common:

212 B.C. "But none of the enemy coming out against them, they gathered the spoils at their leisure and collecting the bodies of their own troops into a heap, burnt them. . . . As soon as daylight discovered the flight of the enemy, Marcellus, leaving his wounded under the protection of a small garrison at Numistro, in command of which he placed Lucius Furius Purpureo, a military tribune, commenced a close pursuit of Hannibal and overtook him at Venusia" (XXXVII, 33).

203 B.C. "The wounded were then conveyed into the town of Eburæ, and the legions marched through Carpetania, against Contrebia" (XL, 33).

In 478 B.C., we find Fabius Maximus leaving his wounded in the houses of patricians, particularly of his own family:

478 B.C. "And not unmindful of that which he had conceived at the beginning of his consulate, namely the regaining of the affection of the people, he distributed the wounded soldiers among the patricians to be cured. Most of them were given to the Fabii, nor were they treated with greater attention in any other place. From this time on the Fabii began to be popular, and that not by any practices except such as were beneficial to the state" (II, 47).

Desertion of the wounded in a tight place was more common among the Volscians and Carthaginians than the Romans:

421 B.C. (Volscian Wars): "Such a panic seized both camps, from their un-

<sup>12</sup> "Fuitque urbs per illos dies, quamquam maestæ facie, veterum instituti similis, qui magna post proelia sanctorum largitione et cura sustentabant." Tacitus, *Annales*, IV, 63.

certainly as to the issue, that, leaving behind their wounded and a great part of their baggage, both armies, as if vanquished, betook themselves to the adjoining mountains" (IV, 39).

341 B.C. (Conflict with the Hernicians: "Many fall on both sides; more are wounded. . . . Next day the camp of the Hernicians was deserted, and some wounded men were found left behind" (VII, 8).

340 B.C. "The Volscians, reckoning up what men they had lost in battle, had by no means the same spirit to repeat the risk. They went off in the night to Antium as a vanquished army in the utmost confusion, leaving behind their wounded and part of their baggage" (VIII, 1).

As late as 210 B.C., we find Marcellus unable to follow up his victory over Hannibal on account of solicitude for his wounded:

201 B. C. "The following night, Hannibal decamped. The great number of the wounded prevented Marcellus from following him as he desired" (XXVII, 2).

Early in the Samnite Wars it had been found that the presence of the wounded at the front after a battle had a deplorable effect upon the morale of the command:

295 B.C.: "They all assured him that they would do everything in their power, but that the soldiers were quite dejected; that, from their own wounds, and the groans of the dying, they had passed the whole night without sleep; that if the enemy had approached the camp before day, so great were the fears of the troops, they would certainly have deserted their standards" (X, 35).

The bad effect of epidemic disease upon morale is emphasized in the account of the siege of Syracuse, and it is of interest to note here that the sick were attended and cared for, perhaps by comrades, if not by women:

212 B.C.: "They were visited too by a plague; a calamity extending to both sides, and one which might well divert their attention from schemes of war. . . . The intolerable intensity of the heat had an effect upon the constitution of almost every man in both camps. At first they sickened and died from the unhealthiness of the season and the climate; but afterwards the disease was spread by merely attending upon and coming in contact with those affected;<sup>14</sup> so that those who were seized with it either perished, neglected and deserted, or else drew with them those who sat by them and nursed them, by infecting them with the same violence of disease.<sup>15</sup> Daily funerals and deaths were before the eye, and lamentations were heard from all sides, day and night. At last their feelings had become so completely brutalized by being habituated to these miseries, that they not only did not follow their dead with tears and decent lamentations but they did not even carry them out and bury them; so that the bodies of the dead lay strewn about, exposed to the view of those who were awaiting a similar fate; and thus the dead were the means of destroying the sick, and the sick those who were in health, both by fear and by the filthy state and the noisome stench of their bodies. Some, preferring to die by the sword, even rushed alone upon the outposts of the enemy" (XXV, 26).

<sup>14</sup> "Curatio ipsa et contactus aegrorum vulgabat morbos."

<sup>15</sup> "Aut assidentes curantesque eadem vi morbi repletos secum traheret." This is exceedingly interesting as showing that Livy (59 B.C.-17 A.D.) had, in his time, some notion of contagion, to which the Greeks were blind. Virgil, living in the same period, is aware of the possibility of contagion among cattle: "Nec mula vicini pecoris contagia laedent." *Eclogue*, I, 51.

It was sometimes dangerous for a Roman commander to neglect his wounded; his soldiers would not fight for him if he did:

323 B.C.: "The experienced commander quickly perceived the circumstances which prevented his success, and that it would be necessary to moderate his temper, and to mingle mildness with austerity. Accordingly, attended by the lieutenants-general, going around to the wounded soldiers, thrusting his head into their tents, and asking them, one by one, how they were in health; then mentioning them by name, he gave them in charge to the officers, tribunes and prefects. This behavior, popular in itself, he maintained with such dexterity that by his attention to their recovery he gradually gained their affection; nor did any thing so much contribute to their recovery as the circumstances of this attention being received with gratitude. The army being restored to health, he came to an engagement with the enemy, and both himself and the troops being possessed with full confidence of success, he so entirely defeated and dispersed the Samnites that that was the last day they met the dictator in the field" (VIII, 36).

At the battle of Nadogare (204 B.C.), the Carthaginians even drove away their panic-stricken and wounded in order not to demoralize that part of their fighting line which was holding its ground:

204 B.C.: "Not even then, however, did they receive unto their line the terrified and exasperated troops, but closing their ranks, drove them out of the scene of action to the wings and the surrounding plain, lest they should mingle these soldiers, terrified with defeat and wounds, with that part of their line which was firm and fresh" (XXX, 34).

In the same battle, Scipio Africanus had already some arrangement for evacuating his wounded to the rear during the engagement:

204 B.C.: "Scipio, perceiving this, promptly ordered the signal to be given for the spearmen to retreat, and having taken his wounded to the rear (*postremam in aciem*) brought the *principes* and *triarii* to the wings, that the line of spearmen in the center might be more strong and secure" (XXX, 34).

That more died from battle wounds than were killed did not escape the attention of the historian:

310 B.C.: "And among the Romans, so numerous were the wounds that more wounded men died after the battle than had fallen on the field" (IX, 32).<sup>16</sup>

Observations of this kind, in which Livy is more profuse than any other historian, undoubtedly had their weight in bringing to pass an organized medical service for the Roman Army, mainly on account of the effect of such losses upon military operations.

The argument of one of the lost books of Livy (Book LVII) records the terrible *dressage* initiated by Scipio Africanus as a measure against prostitution in cantonment areas; but it is not known whether this lost

<sup>16</sup> "Et apud Romanos tantum vulnerum fuit, ut plures post proelium pauci decederent, quam occiderant in acie" Livy, IX, 32

book contained any reference to venereal disease, over and above the obscure allusions in Martial and Juvenal:

Scipio Africanus laid siege to Numantia (B.C. 133), and restored to the strictest military discipline the army, which had been corrupted by licentiousness and luxury; this he effected by cutting off every kind of pleasurable gratification; driving away the prostitutes who followed the camp, to the number of two thousand; keeping the soldiers to hard labor, and compelling every man to bear on his shoulders provisions for thirty days, besides seven stakes for their fortifications. To any one who lagged behind on account of the burden, he used to cry out: "When you are able to defend yourself with your sword, then cease to carry your fortification"; he ordered another who carried with ease a small shield, to bear one unusually large; and not infrequently ridiculed them for being more expert in managing their shields for the defence of their own bodies than their swords for the annoyance of those of the enemy. When he found any man absent from his post, he ordered him to be flogged with vine twigs, if a Roman; if a foreigner, with rods. He sold all the beasts of burden, that the soldiers might be forced to carry their own baggage. He engaged in frequent skirmishes with the enemy, with good success.

That Roman barracks were still huts of the Homeric type, even during the second Punic War, is also recorded by Livy:

212 B.C.: "He had compelled his soldiers, withdrawn from the houses, to build themselves huts after the military manner, near the gates and walls; at once, that the houses of the city might be let and occupied with the land, and also through fear, lest the excessive luxury of the city should enervate his troops as it had those of Hannibal. Now most of these were formed of hurdles and boards, others of reeds interwoven, all being covered with straw" (XXVII, 3).

In the Etrusean Wars, winter huts were a novelty:

402 B.C. (War with Veii): "When the Roman generals conceived greater hopes from a blockade than from an assault, winter huts also, a thing quite new to the Roman soldier, began to be built. . . . They were harassed and worked much more severely than those of Veii. For the latter spent the winter beneath their own roofs, defending their city by strong walls and its natural situation, whilst the Roman soldier, in the midst of toil and hardship, continued beneath the covering of skins, overwhelmed with snow and frost, not laying aside his arms even during the period of winter, which is a respite from all wars by land and sea" (V, 2).

The following passages in Livy are of particular importance as showing that the bandaging of wounds, by soldiery themselves, was a commonplace procedure in the earlier Roman armies:

448 B.C.: "While stripping the body of his enemy, he (Herminius) himself received a wound with a javelin; and though brought back to the camp victorious, yet he died during the first dressing of it" (II, 20).

351 B.C.: "The consul (Marcus Popillius Laenas), having his left arm well-nigh transfixured with a javelin, while he exposed himself incautiously in the van, had retired for a short while from the field, and now, by the delay, the victory was on the point of being relinquished, when the consul, having had his wound tied up, riding back to the van, cries out, 'Soldiers, why do you stand,' etc." (VII, 24).

That Roman commanders themselves were sometimes expert in

wound treatment, and attended their own men, is recorded by both Dionysius and Polybius:

"When the consul Emilius, after the defeat of the Volscians, had set up a camp at Longula, he remained there and restored the wounded with remedies" (Dionysius, VIII, 35).

Publius Cornelius Scipio, severely wounded in the battle of the Trebia (220 B.C.), "occupied himself with the treatment of his own wounds and those of his comrades" (Polybius, III, 66, §9).

As we approach the period of Julius Caesar, evidences of the existence of wound surgeons (*medici vulnerarii*) in the Roman army become more definite. Archagathus, the first Greek physician to settle in Rome (219 B.C.), was called by the people *vulnerarius*, on account of his surgical skill, and *carnifer* (butcher) on account of his bloody operations. He was forced to leave the city. Cicero, in his second Tusculan Disputation (*circa* 70 B.C.), says:

If we notice how the wounded, borne in from the line of battle, behave themselves, it will not escape our observation that raw recruits make shameful outcries over slight wounds, while the experienced, seasoned soldier is pluckier and merely looks around for a surgeon to apply the dressing.<sup>17</sup>

Virgil (70-20 B.C.) introduces the aged wound-surgeon, Iapyx, and the physician-priest, Umbro, as stock figures in the *Aeneid* (VII, 756; XII, 396), with accounts of wound-treatment (XII, 387; 400; 411). Caesar himself, distributed his wounded in places occupied by Romans,<sup>18</sup> and his subaltern field-commander, Labienus, had advanced far enough in methods of evacuation to send his wounded to Adrumentum in wagons for treatment (46 B.C.).<sup>19</sup>

But the great improvements that were to come in Roman medico-military administration were bound up with the advancement of medicine in Rome by Greek physicians.

### *Greek Medicine in Rome*

The story of the introduction of Greek medicine into Rome has recently been told with unapproachable skill and charm by Sir Clifford Allbutt, to whose pages the reader may be referred for the extraordinary array of minutiae which have accumulated about this phase of history, through the labors of medical philologists. The matter was of greatest moment for the future medical administration of the Roman army as it meant the gradual breaking down of the ancient Latin prejudice against medical science, the actual residence in Rome of the greatest physicians

<sup>17</sup> "Quin etiam vulnus ex acie offerri saepe saucios, et quidem rudem illum et inexercitatum quamvis levi ictu ploratus turpissimos edere; at vero ille exercitatus ob eam rem fortior, medicum modo requirit, a quo obligetur." Cicero: *Disp. Tusc. iv*, 16, 38.

<sup>18</sup> Caesar: *De bello civili* III, 75; 78, 2.

<sup>19</sup> "Saucios in plaustris deligatos jubet Adrumentum deportari." Caesar: *De bello Africano*, 21.

of the period, and the eventual participation of Roman citizens themselves in the civil and military practice of medicine.

The prejudice of the Roman citizen against Greek physicians was due to the fact that the first to come into the city were slaves (*servi medici*), who were sometimes employed to poison enemies by their masters. Archagathus, the first Greek physician to settle in Rome (220 B.C.), was, however, accepted as a Roman citizen and had an office (*taberna*) near the Forum Marcelli.

Greek medicine acquired consideration and esteem through the superior abilities of Aesclepiades of Prusa (Bithynia), who settled in Rome in 91 B.C. and lived to an extreme old age.

Extolled by Celsus and Scribonius Largus, reviled by Pliny and Galen because of his Alexandrian training, Aesclepiades had many of the traits of the "society physician." His observation that Nature is as likely to kill the patient as to cure him was reiterated by Sir William Gull in a conversation with Huxley. A master of rhetoric and sophistry, Aesclepiades was alive with the discriminating intelligence of the Greek. He inculcated the atomic theory of Democritus, held that the "soul" is not an entity but the sum of the functions of the body, experimented with decerebrated animals, differentiated mental disorders from the cerebral manifestations of disease other than those of the brain, and won over the Romans by his mild and rational system of physiological therapeutics (diet, baths, gymnastics, massage, etc.). His voluminous writings have been lost and he exists for us only in a few fragments and stray references.

Celsus, who flourished in the reign of Tiberius Caesar (14-37 A.D.), was inferentially a Roman citizen, who compiled the most valuable encyclopædia of medicine and surgery in antiquity. This work, mainly derived from Greek sources, shows the notable advances made in the practice of medicine during the five centuries between Hippocrates and the Christian era. The degree of specialization attained is fairly indicated in the titles of some of the chapters, e.g., on diseases of the colon, on the varieties of phthisis, on diseases of the stomach, liver, spleen, kidneys; on diseases of the skin, ears, eyes, nose, mouth, tonsils; on wounds of the intestines, on hernia, varix, varicocele, gangrene, etc. The chapter on military surgery is entitled "On the extraction of weapons from the body,"<sup>20</sup> and is of particular interest as showing that stones and leaden bullets, discharged by the Balearic slingmen or the ballistic apparatus, were sometimes lodged in the body, even before the days of firearms:

"When foreign substances, such as weapons, have penetrated the body, their extraction is frequently attended with great trouble. There is some difficulty arising from the different kinds of them, and sometimes from the nature of the parts they have penetrated. Now every weapon is extracted, either in the direction by which it entered, or in the point to which it tends; in the first case it returns by the same passage itself has made; in the latter it must receive its exit from the scalp. For

<sup>20</sup> Celsus: *De re medica*, vii, 5. Transl. by Alex. Lee, London, 1831, 231-239.

the flesh must be incised over the weapon's point. But if the weapon have not pierced far, and is only under the surface of the flesh, or at least have not passed through large veins and nervous parts, the best plan is to remove it by the way it entered.

But if the space through which the weapon has to return be more than that which is to be laid open, and it has already passed through veins and nerves, it will be more advisable to open what remains, and to extract it in that direction; for it will be found nearer, and drawn out with greater safety; and when the weapon has passed beyond the middle of one of the larger limbs, it will heal the sooner for being pervious, as the wound may be dressed at both extremities.

But if the weapon is to be withdrawn by the same way it entered, the wound must be enlarged by the scalpel, in order that it may pass the more easily, and produce less inflammation, which will be greater if the flesh be lacerated in withdrawing the weapon. Again, if a counter-opening is to be made in any part, it ought to be so large, that the weapon may not increase it in transit. In either case, the utmost care should be employed, lest a tendon, or large vein, or artery be divided.

When any of these are exposed, it must be seized by the blunt hook, and held aside from the knife. But when the incision has been made sufficiently large, then the weapon must be taken out by the same means, and the same circumspection is to be used, lest any of those parts which I have already mentioned be injured whilst the weapon is being taken out.

The preceding observations are general; but there are certain peculiarities in the several kinds of weapons which I shall subjoin immediately. Nothing penetrates the body with greater facility than an arrow; and it also lodges at the greatest depth. Now this happens, both because it is propelled with great force, and because it is in itself of a narrow slender form. Therefore it must be withdrawn more frequently from the opposite part, than from the one on which it entered, and that especially since it is mostly surrounded with barbs, which lacerate more by a retrograde motion, than when extracted in the opposite direction. A counter-opening being made, the flesh ought to be drawn apart by an iron instrument made in the form of the Greek letter A: then, when the point has appeared, if the shaft adhere, it must be propelled forward until it can be seized on the opposite side and extracted; but if the shaft have been detached, and only the iron head remain within, the part must be grasped either by the fingers or by the forceps, and so drawn out.

Neither is there any other method of extracting it, when it is considered advisable to remove it by the orifice it came. For the wound being enlarged, either the shaft, if there, is to be extracted, or, if not there, the iron head itself. But if the barbs are discovered, and they appear to be short and small, they ought to be broken there by the forceps, and the weapon freed from these to be drawn out; but if these barbs be large and very strong, they are to be covered by split writing-reeds, and so extracted, lest they should lacerate any part. These observations are to be followed in extracting arrows.

But if a broad weapon were lodged in the body, it is improper to dislodge it by a counter-opening, lest we add another large wound to the one already made by the weapon itself. Therefore it is to be extracted by a certain kind of iron instrument which the Greeks denominate the graphiskos of Diocles, because Diocles was the inventor of it, whom I have already noticed as the greatest among the ancient physicians. Namely, a plate of iron, or even of brass, at one end having two hooks turned downwards on each side; the other end is folded or turned up on each side, and the extremity slightly curved towards that part which is bent, and it is also



perforated there. This is introduced transversely near the weapon; and then, when it has reached the farthest point of it, it is to be turned a little, so that it may receive the weapon in its opening. When the point is in the perforation, two fingers are to be applied to the hooks at the other end, when the instrument and weapon are to be extracted at the same time.

The third kind of missile which ought to be extracted sometimes is a leaden bullet, or stone, or something similar, which having perforated the skin, becomes entirely concealed there. In all such cases, the wound must be enlarged, and the foreign body must be withdrawn with the forceps by the way it entered.

The operation is more difficult in every wound, if the foreign body is either fixed in a bone, or has plunged itself in a joint between two bones. In the bone, the weapon must be moved to and fro till it becomes detached where it was grasped at the point; and then the weapon may be extracted either with the hand or forceps, as in drawing a tooth. By this method, it scarcely ever happens that the weapon is not brought away; but if it still remains, it may be dislodged by striking it with some iron instrument. The last resource, when we have failed to remove it, is to perforate the bone near the part with a trephine, and from that opening to excise the bone in the form of the letter V, so that the lines may converge towards the point of the weapon; this being done, it must necessarily give way, and be easily extracted.

But if it has penetrated the articulation between two bones, the two limbs are to be bound up with bandages or straps, in the vicinity of the wound; these are to be drawn in contrary directions, in order to put the tendons on the stretch; which being done, the space between the bones is enlarged, so that the weapon may be withdrawn without difficulty. Care must be taken, as I have observed in other places, that no nerve, vein, or artery, be wounded by the weapon in the act of extracting it; and this may be prevented by the same means which I have already mentioned.

But if any person has been wounded by a poisoned weapon, the same means must be employed in every respect, and with all possible celerity, as if poison had been drunk, or as if stung by a serpent. When the weapon is extracted, the wound itself requires no other dressing than that which would be necessary if nothing had lodged there; concerning which I have said enough in another place."

Contemporary with Celsus were three eminent surgeons, Heliodorus, Archigenes and Antyllus, and a little later Dioscorides, in the reign of Nero (54-68 A.D.) wrote the first book on *materia medica*. Aretaeus (2-3 Century, A.D.) wrote a book on practice, the most remarkable in antiquity for literary elegance, but mainly derived from Archigenes. Two Ephesians, Rufus and Soranus, both of the 2d Century, A.D., are also outstanding figures in the medical literature of the period. The period closes with the great name of Galen (131-201 A.D.), the greatest experimenter in physiology among the ancients, the most voluminous of all the ancient physicians. Galen did much for the comparative anatomy and physiology of the nervous and locomotor systems, was the first to observe aneurism, stated the four classical symptoms of inflammation, and devised many improvements in therapy, particularly the use of milk diet and climatic treatment in phthisis. A practitioner of unusual shrewdness, he wrote the first tract on malingering or feigned diseases, which was translated three times in the 16th century, and latterly by Frölich.<sup>21</sup> The Galenic system dominated European medicine for nearly seventeen centuries.

By the *lex Julia* (90 B.C.), Roman citizenship had been conferred upon all native Italians and in 46 B.C., Julius Caesar, as Suetonius

<sup>21</sup>Frölich: Friedreich's Bl. f. gerichtl. Med., Nürnberg, 1889, iv, 21-26.

relates, "conferred citizenship on all practitioners of medicine and all professors of liberal arts in Rome, to make them more desirous of living in the city and to induce others to come there."<sup>22</sup> In the opinion of Marquardt, this far-sighted policy was an expression of Caesar's desire to do something for the medical service of the Roman Army.<sup>23</sup> The city began to swarm with physicians, eager for the *jus quiritium*, and the Roman Quirites themselves no longer disdained to study medicine. Roman physicians, such as Cassius Felix or Scribonius Largus, had already attained distinction in medical literature, and later Antonius Musa became the intimate of Horace and the physician to Augustus Caesar. Scribonius Largus served with Claudius in Britain. Galen was invited to accompany Marcus Aurelius on his campaign against the Marcomanni.

### *Battle Losses in Antiquity*<sup>24</sup>

In the later Greek and Roman historians, we begin to get definite statistics of battle losses, and while the figures given are large and obviously approximations, it is assumed by Frélich that they are in the main correct, for the following reasons:

(1) The aim of ancient armies was not merely to cripple the enemy's forces, but to destroy them utterly, which, in itself, would imply a high mortality on the losing side. (2) In the German wars, it was impracticable and impossible for the Romans to take care of a great horde of captives and *vice versa*. (3) The Persian and Germanic thrusts were almost in the nature of folk-migrations, homeless, formless caravans of people, risking their all, without any reserve forces to rely upon, and even accompanied by women and children. It may further be noted that the lustration of Roman troops before and after a battle, in connection with the recruiting of the army by the census, constituted a very real check upon the actual numbers engaged and the losses sustained. After Caesar's bloody battle with the Helvetians in 58 B.C., a similar count of the total population and the number available for warfare was found to be inscribed on tablets in the Helvetian camp.

At Marathon (490 B.C.), 10,000 Athenians are said to have engaged 210,000 Persians, with losses of 192 Greeks and 6,400 Persians. At Plataea (479) B.C., 105,000 Greeks opposed 325,000 Persians with a loss of only 1,360 Greeks and the utter routing of the Persian forces. Of the 23,000 Greeks who marched with Cyrus against Artaxerxes in 401 B.C., only 8,000 returned. As we approach the Roman period, figures become more credible. At Asculum (280 B.C.), Pyrrhus lost 3,500 men. In the second Punic war, Regulus lost 13,500 men out of 15,500 in Africa. Hannibal started across the Alps in 218 B.C. with 100,000 infantry and 12,000 cavalry and had only 20,000 infantry and 6,000 cavalry when he reached Italy. In his victory at Lake Trasymene, (217 B.C.), 13,000 Romans were destroyed and 10,000 taken prisoner, while the Carthaginians lost but 1,500 in battle, many more dying of wounds later. At Cannae (216 B.C.), the Romans suffered the staggering loss of 60,000 killed and 10,000 taken prisoners, out of an army of 85,000. Hasdrubal lost 50,000 out of 60,000 at Metaurus (207 B.C.) and Hannibal 20,000 killed and

<sup>22</sup> "Omnisque medicinam Romae professor et liberalium artium doctores, quo libentius et ipsi urbem incolerent et ceteri adpeterent, civitate donavit" Suetonius, Divus Julius, 42.

<sup>23</sup> Marquardt & Mommsen. *Handbuch der römischen Alterthümer*, 2. Aufl., Leipzig, 1884, v, 556.

<sup>24</sup> *Erheb. Zuehr. U. Krankenpflege*, Berl., 1896, xviii, 41-45.

20,000 prisoners out of 50,000 at Zama (202 B.C.). When Carthage was destroyed in 146 B.C., the city of 700,000 inhabitants had been reduced to 50,000 by the Punic Wars. In the Civil War of 49 B.C., 170,000 out of 320,000 Romans were destroyed. In 113 B.C., 300,000 Cimbri began to migrate southward and eventually slaughtered 120,000 Romans (105 B.C.). In 102, Marius destroyed 200,000 Teutons at Aquae Sextiae and took 80,000 prisoners; in 101, 130,000 out of 150,000 Cimbri were killed. In 58, Caesar slaughtered 238,000 Helvetians and in the same year, defeated Ariovistus, who lost 80,000. In 57, Caesar destroyed 55,000 out of 60,000 Nervi on the Sambre. At the destruction of Jerusalem (70 A.D.), it is recorded by Josephus (VII, 17), that 1,100,000 were slain. In the revolt of the Jews against Hadrian (133 A.D.), 60,000 were slain. The great epidemics of the past, e.g., the plague at Athens, described by Thucydides and Lucretius, the Orosian, Cyprian and Antonine plagues, the epidemics attacking the Carthaginian forces at Agrigentum and Syracuse, also occasioned frightful mortality; and the introduction of malarial fever into Greece is held by Jones<sup>25</sup> to have been the cause of the decline of the Hellenic civilization.

#### *Later Organization of the Roman Army*<sup>26</sup>

Before the bloody period of the Civil Wars, the Roman Army had been recruited by a census of property-holding citizens. In course of time the heavy infantry of the line, made up of the middle classes, came to be selected not according to property qualifications but by length of service, and the Italian allies (*socii*) had long since been permitted to serve. Following the Civil Wars, still more important changes were effected by Gaius Marius (155-86 B. C.), a man of humble origin, whose military abilities had advanced him from the plow to the consulship by 107 B. C. Before his time, the aristocracy had long since given up service in the army, the middle class had almost ceased to exist, the allies (heavy troopers from Thrace, light African cavalry, Ligurian light infantry and Balearic slingers) made up the main contingent, and voluntary enlistment of the poor had become customary. In 107 B. C. Marius made voluntary enlistment accessible to all. The maniples were now replaced by heavy cohorts, ten of which made a legion of 6,000 men. This dense rigid formation became necessary, as in the Napoleonic wars, through "the decline in morale of the rank and file" (Atkinson). "The morale of the Roman army was founded no longer on patriotism but on professional pride and *esprit de corps*" (Atkinson). These paid soldiers were usually enlisted for life; training was uniform, promotion mechanical, service became entirely professional, and as Mommsen says, the silver eagle of the legions "proclaimed the advent of Emperors." This new standing army proved, however, to be the salvation of Rome during the bloody periods of the Civil and German wars. When Octavius Caesar came to power after the battle of Actium

<sup>25</sup> W. H. S. Jones: *Malaria and Greek History*. Manchester, 1909.

<sup>26</sup> Atkinson, *op. cit.*, 595.

(31 B. C.), he had upon his hands a great army variously distributed. This he cut down to a select force of 25 legions, while the Pretorian guard, destined to become the enemies of the people and the assassins of many emperors, occupied and guarded Italy. In such a standing army of 300,000 picked men, with long terms of enlistment, the need for some sort of medical organization and administration was obvious and the means of effecting it were happily supplied by the improved social status of physicians and of medical practice in Rome.

### *Establishment of a Medical Service in the Roman Army*

Evidence on this matter is scattered and tangential, for the reason noted by French physicians in the eighteenth century, viz., that secular historians seem to be in a conspiracy to omit all mention of medicine from their writings.<sup>27</sup> Even in the reign of Vespasian (69-79 A. D.), when the Roman army consisted of 30 legions, 10 Pretorian cohorts and auxiliary troops, medicine was still regarded as a "*negotium sordidum*." The *Constitutiones* or legal enactments of Augustus, containing his prescriptions for the reorganization of the Roman army, have unfortunately been lost,<sup>28</sup> but that he must have made due provision for a medical establishment may be inferred from the fact that he gave to all free physicians (including educated army surgeons) the equestrian dignity (*dignitas equestris*)<sup>29</sup> which conferred the right of full citizenship with the privilege of wearing the ring of the knightly class. That educated physicians (*medici*) were attached to the Roman Army before the Christian era is evident from passages in Cicero (70 B. C.), Celsus, Galen, Lucian, and the Platonist Onosander.<sup>30</sup> In the *Tactics of Claudius Elianus* (100-140 A.D.), dedicated to Emperor Hadrian, they are distinctly classed among non-combatants (*ἀμαχοι*)<sup>31</sup> and the services of legionary physicians (*medici legiones*) are commemorated in some 46 Latin inscriptions of the Empire (1st-2d Century, A.D.).<sup>32</sup> Early in the Christian era, marked solicitude for the wounded, whether real or affected, became an almost official trait or social obligation of the Roman emperors. The crafty Tiberius (14-37 A.D.) won the favor of his troops on his Illyrian campaign by taking with him physicians, litters

<sup>27</sup> Dujardin & Peyrilhe. *Histoire de la chirurgie*, Paris, 1774-80, ii, 386, Cited by Corlieu.

<sup>28</sup> Jans. *Geschichte der Kriegswissenschaft*, München & Leipzig, 1889, 84. Cited by Haberling.

<sup>29</sup> Dio Cassius, lvi, 30, Cited by Haberling.

<sup>30</sup> Cicero: *Tusc. Disp.*, ii, 16, §38. Celsus: *De re medica*. Proaemium. Galen: *Opera*, ed Kühn, iii, 551, 786, xiv, 604, 1031. Lucian (Teubner ed.) Leipzig, 1852, ii, 10. Onosander: ed. Köchly (Teubner), i, §§ 13-14, pp 5-6. Cited by Haberling.

<sup>31</sup> In: *Griechische Kriegsschriftsteller* (Köchly & Hüstow), Berlin, 1855, pt. 2, 248. Cited by Haberling.

<sup>32</sup> Haberling. *Die altrömischen Militärärzte*, Veröffentl. a. d. Geb. d. Mil.-San.-Wesens, Berlin, 1910, 19, 76.

and a special bath for the wounded.<sup>33</sup> Germanicus, on the northern marches, relieved the wants of his soldiers at his own expense, "visited the sick, applauded their bravery, examined their wounds,"<sup>34</sup> while his wife, Agrippa "took upon herself the functions of a general officer, attended to the wants of the men, distributed clothes to the indigent and medicine to the sick (Tacitus).<sup>35</sup> Trajan (98-117), most firm and able of the emperors, was praised by Pliny and Dio Cassius for paying for the care of sick soldiers out of his own pocket and visiting the wounded in their tents after a battle.<sup>36</sup> This was also the custom with his successor Hadrian (117-138) and of the later emperors, including Alexander Severus (222-235) who said that he cared more for his soldiers than himself, since upon their welfare hinged and hung the welfare of the state.<sup>37</sup> The aphorism of Aurelian (270-275): "Free medical treatment for the soldier" (*Milites a medicis gratis curentur*), might well be inscribed over every military hospital. This royal solicitude for the disabled soldier in a long succession of emperors implies, in itself, a definite organization of hospitals and personnel for the care of the sick and wounded in campaign.

While no date can be assigned for the establishment of such an elaborately organized medical personnel as is apparent from the carved inscriptions, it is fair to assume that by the time of Trajan and Hadrian (98-138 A.D.), every closed formation, every legion, every warship had attached to it a physician. The column of Trajan, commemorating his victories in the Dacian campaign, shows army surgeons bandaging the wounded and wearing the arms and uniform of the legionary troops. The grammarian Hyginus, who lived sometime in this period, dedicated to Trajan his book on the munitions of Roman camps (*De munitione castrorum*), which contains an account of Roman military hospitals, the very existence of which implies a well-organized medical personnel.

Accepting the conservative conclusions of Kühn, Brian, Gaupp, Frölich, Marquardt, Haberling and Withington, the following may be inferred from the scattered information conveyed in the Latin writers, the inscriptions and the Digests of the Roman laws:

Each of the 25-30 legions, of 10 cohorts each (numbering 6500-

<sup>33</sup> "Jam medici, jam apparatus cibi, jam in hoc solum portatum instrumentum balinei nullius [militis] non succurrit valetudini" Velleius Paterculus: *Historia Romana*, ii, 114, §1 (Teubner, 1876, p. 115). Cited by Haberling.

<sup>34</sup> "Germanicus . . . propria pecunia militem juvit. Utque cladis memoriam etiam comitate leniret, circumire sancios, facta singulorum extollere; vulnera intuens alium spe, alium gloria, cunctos adloquio et cura sibi que et proelio armabat. Tacitus: *Annales*, i, 71.

<sup>35</sup> "Sed femina iugens animi munia ducis per eos dies induit, militibusque, ut quis inops aut sancios, vestem et fouentem dilargita est" Tacitus: *Annales*, i, 69, cited by Frölich.

<sup>36</sup> Pliny, *Panegy.* in Trajan, 13; Dio Cassius, 68. Cited by Frölich.

<sup>37</sup> "Milites se magis servare, quam se ipsum, quod salus publica in his esset" Thus Lampadius *Historiæ augustæ scriptores sex*, cap. 47. Cited by Frölich.

7000 men in all) had a legionary physician (*medicus legionis*); each of the 9 Pretorian cohorts, the 4 urban cohorts and the 7 cohorts of *vigiles* (who acted as police and firemen in the city) had four cohort surgeons (*medici cohortis*). Every body of auxiliary troops and every ship of the Pretorian fleet had also physicians. All these physicians, as part of the military establishment, were regarded as *immunes*, exempt from guard and combat duty or day labor, and ranked among the *principales* (non-commissioned officers). In the Pretorian and city cohorts, they were required to be Roman citizens, while the physicians of the *vigiles* and auxiliary troops, serving in Italy and the provinces, could be freedmen or foreigners. For this reason, the staff surgeons of these latter organizations were called *medici ordinarii*. The legionary physicians were all of equal rank, had no other medical superiors and were subordinated only to the camp commander (*praefectus castrorum*) or, in his absence, to the tribunes of the legions. The social status of the medical staff in this military hierarchy was that of the innumerable grades of non-commissioned personnel and of the highly elaborated bureaucracy attached to the army, which included accountants, notaries, registrars, secretaries and civilian functionaries of all kinds.<sup>38</sup>

#### *Military Medicine in the Inscriptions of the Empire*

So much of Roman history is contained in the inscriptions of the Republic and the Empire that this branch of epigraphy has become a little science in itself. The most typical and most famous of all the Roman inscriptions is that on the Arch of Titus (72 A.D.), which immortalizes the devotion of the Senate and the people to the deified Augustus, to Titus and to Vespasian.<sup>39</sup>

SENATVS  
POPVLVSQVE.ROMANVS  
DIVO.TITO.DIVI.VESPASIANI.F  
VESPASIANO.AVGVSTO

No less than 46 different inscriptions, giving the name, organization and rank of some 60 Roman army surgeons, have been found in different parts of Italy, Germany, Austria, England, France, Holland, Switzerland, Roumania, Bulgaria, Servia, Asia Minor, Egypt and Algeria.<sup>40</sup> The wide range of these finds, the gravestones of those who died in

<sup>38</sup> Marquardt & Mommsen. *Handbuch der römischen Alterthümer*, 2. Aufl. Leipzig, 1884, v, 554-557.

<sup>39</sup> The majestic capital letters of this inscription, carved by the stone-cutter as if for some supreme occasion, are identical with those familiar to us in the beautiful font of type devised by the Venetian printer, Nicholas Jenson, for the medical books published by him in 1471. They are commonly seen on public buildings, e.g., in the inscription over the central entrance of the present Munitions Building, in which the Surgeon General's Office is now housed.

<sup>40</sup> Haberland. *Vereinfacht u. d. Geh. d. Mil. San. Wesens*, Heft 12, Berl., 1910, 19-76.

foreign lands, is evidence in itself of the extensive medical organization of the Roman army during the first two centuries of the Christian era. Very typical is the pathetic inscription on the six-foot tombstone of a *medicus ordinarius* of the Tungrian cohort in Britain (*circa* 83, A. D.) found near the site of the Roman wall near Housesteads, and now in the Newcastle Museum:

D. M.  
ANICIO  
INGENVO  
MEDICO  
ORD. COH  
I. TVNGR  
VIX. AN. XXV.

D[iis] M[anibus], Anicio Ingenuo, Melico Ord[inario] Coh[ortis] primae Tungr[orum]. Vix[it] An[nis] XXV.

To the Gods of the Shades:<sup>41</sup> Anicius Ingenuus, Ordinary Physician of the First Tungrian Cohort. He lived 25 years.

Another, found in Rome, reads:

Aselepio et saluti commillitonum. Sex[tus] Titius Alexander, medicus Coh[ortis] V. pr[ae]toriae donum dedit [Imperatore Domitiano] Aug[usto] octavum T[ito] Flavio Sabino consulibus.

Sextus Titius Alexander, physician to the Fifth Pretorian Cohort, dedicates this stone to Esculapius and to the health of his comrades. [In the reign of Domitian.] Consulate of Augustus Titus VIII and Flavius Sabinus.

An inscription of 155 A. D., found in Kutlovica (Bulgaria) shows that a detachment of the 10th (Claudian) legion had a *medicus* among the *principales*, whence it may be inferred that each of the 10 cohorts in a legion had separate medical personnel. An inscription found in 1902 at Kistanye (Hungary) shows, carved underneath, a surgical case with instruments.<sup>42</sup> An inscription from Lannuvium, deciphered by Mommsen, shows that legionary physicians did not serve continually with one organization, but might be transferred to others. The inscriptions of the Pretorian cohorts show that each of these had a surgeon, and sometimes also a *medicus clinicus* or internist. One found at Lyons in 1833, relating to the 13th Urban Cohort, is in memory of a *medicus castrensis* or camp physician. An inscription of the time of Hadrian, found at Rome, shows that the emperor's cavalry guard (*equites singulares Augusti*) had a troop surgeon. Two pillars set up by the second and fifth cohorts of the *vigiles*, in honor of the emperor Caracalla (212 A.D.) have engraved upon them the names of four *medici* each.<sup>43</sup>

<sup>41</sup> "Gods of gloom" is Swinburne's poetic translation of  $\chi\theta\acute{o}\nu\epsilon\omicron\iota$ , or *Dii Manes*, i. e., the shades or ghostly divinities of the infernal regions or underworld. For cut of tombstone, see Haberling, 15.

<sup>42</sup> For a cut of which see Haberling, *op. cit.*, p. 24.

<sup>43</sup> For a cut of which see Haberling, p. 41.

and six of the eight names are Greek; the second inscription gives, in addition, the full roster of 13 officers and 1,000 privates. Other inscriptions show that the volunteer organizations (*cohortes civium Romanorum*), the auxiliary forces (*cohortes auxiliares*), the cavalry squadrons (*alae equitum*) and the triremes of the navy had each their own separate medical personnel. The epitaphs of the naval surgeons of the triremes "Cupid" and "Tiger," war vessels with a complement of about 200 rowers and soldiers each, specify them as *duplicarii* (receiving double pay). This compensation, Withington holds, was due to the fact that the Romans disliked the sea and that special inducements had to be held out to those undertaking this hazardous service.<sup>44</sup> From the 56 known inscriptions, it may be gathered that the medical administration of the Roman army and navy in the first two centuries of the Christian era was highly specialized.

Two of the naval inscriptions, and several of the military, indicate that physicians could be admitted to the services at the age of 20-21. A letter of the emperor Antoninus Pius to the legionary physician Aulus Numisius suggests that continuous service was not compulsory for army surgeons; and a sentence in the Theodosian Codex (XIII, 3, 10) establishes the fact that physicians practising in the city of Rome were required to render only a minimum of wartime service (*ad militiam minime comprehendit*).<sup>45</sup> In the Greek papyri of the Alexandrian period, investigated by Sudhoff, a land-grant in Egypt, given to a veteran army surgeon upon his retirement, is mentioned.<sup>46</sup> The pay of the legionary physician was that of the *immunes*, i. e., 225 denarii after Augustus Caesar, 300 after Domitian, 500 after Septimius Severus, while the fleet surgeons received twice these amounts.<sup>47</sup> Whether they paid for their medicine and instruments out of these small sums is not known. The uniform of the army surgeon in the reign of Trajan consisted of a double woolen undershirt (*tunica*), a short scalloped doublet (*focale*), leathern breeches (*bracae*) reaching to the calves, and to which the boots (*caligae*) were attached, a round metal helmet, not covering the neck, and the traditional short sword (*gladius*), attached to a belt (*balticus*).<sup>48</sup> His surgical kit, as described by Gurlt,<sup>49</sup> consisted of metal knives, scalpels, hooks, sounds, forceps, etc., carried in a long slender bronze case; oblong bronze or ivory boxes, for carrying a pocket outfit of medicines have also been found, with figures of Æsculapius and Hygieia, or of the Æseu-

<sup>44</sup> F. T. Withington. *Medical History*. London, 1894, 118.

<sup>45</sup> Cited by Haberland, p. 56.

<sup>46</sup> K. Sudhoff. *Verzähltes aus griechischen Papyrus-Urkunden*, Leipzig, 1909, 257-258.

<sup>47</sup> Haberland, p. 58.

<sup>48</sup> Haberland, p. 59.

<sup>49</sup> Gurlt. *Geschichte der Chirurgie*, Berlin, 1898, i, plates 16-19.



lapium snake, on the covers.<sup>50</sup> The metal field-cases of salves have been described by Denefle.<sup>51</sup> Tacitus mentions the loss of bandaging material in the contest between Caccina and Arminius in the German morass,<sup>52</sup> and it is related of Trajan that "when his bandages began to give out he did not spare his own clothing, but tore it into strips in order to bind up the wounds of his soldiers."<sup>53</sup>

The social status of the Roman army surgeon was not high, his pay and uniform being that of the ordinary soldiery, with whom his name is grouped on the inscriptions; and from this low estate he was never advanced. But in order to attract physicians to the military service and to retain them in it, certain legal privileges were extended. In the Justinian Codex (X, 53 (52), 1, 6), it is specified that a legionary physician was to be exempted from the performance of public works, while on military duty, but not after, unless he elected to serve abroad for a long period, in which case he should later enjoy the privileges of state physicians. Another privilege was the so-called *jus restitutionis* or "right of indemnification" (Digests, IV, 6, No. 33), in virtue of which a military physician was entitled to restitution for any material damage or fraud perpetrated against him while absent on field duty. This privilege was limited by Alexander Severus to a year, but was later extended by Gordian to four years, while, in the opinion of the jurist Julius Paulus (2d Century A.D.), it had no limitation in time (Haberling).<sup>54</sup> The low estate of the Roman army surgeon, and his inability to lift himself and his order out of it, is partly to be explained by the inadequate medical training of his time. Although the greatest Greek physicians of the period were residents of Rome, and many Roman citizens became celebrated in the profession, there was no organization of medical education whatever until the 3d Century A.D.; and, without the aid of printed books (medical manuscripts were scarce), the legionary physicians on field duty were at a sad pass in difficult cases. This explains the various sarcasms of contemporary Greek writers to the effect that the physical exercises exacted by the general were better for the soldier's health than the ministrations of the physicians.<sup>55</sup> It was only after the reign of Septimius Severus (193-211 A.D.) that a state license was required for the right to practice (*medicus a republica probatus*), and Alexander Severus (222-235) was the first to have lecture

<sup>50</sup> Haberling, pp. 59-63.

<sup>51</sup> V. Denefle: *Chirurgie antique*, Anvers, 1893, 12; 33, pl. ii.

<sup>52</sup> Non fomenta sauciis. Tacitus, Ann. i, 65.

<sup>53</sup> Trajanus imperator milites in proelio vulneratos curabat. Cum autem fasciae et volumina deficerent, ne suae quidem vesti pepercit, sed eam totam in ligamenta discedit. Dio Cassius, 68. Cited by Frölich.

<sup>54</sup> Haberling, 64-65.

<sup>55</sup> c. g. Onosander: *Ὁ στρατηγικός* i, 13-14. Cited by Haberling, p. 15.

halls built for the teaching of medicine in Rome.<sup>56</sup> For the advancement of military medicine, the seed thus sown was to come to best fruition in the Eastern Empire.

### *Roman Military Hospitals*

The excavation of three Roman military hospitals, near Vienna, Bonn and the Swiss Baden, during 1887-1904, has revolutionized our knowledge of the status of hospital construction and administration in antiquity. We read of the ancient temples of Æsculapius (Aesclepieia), the superstitious observances of which were ridiculed by Aristophanes, or of the later *Iatreia* or private wards in the houses of Greek physicians, or of the surgeon's operating room (as described by Hippocrates), or of the model room in the surgeon's house at Pompeii, but always with a skeptical feeling that these phases must have been rare and exceptional. Now we have the evidence of actual structures, which can be studied in the plans.

The Roman landlords eventually acquired *valetudinaria* or quarters on their estates for sick slaves, more from a gradual perception of the economic advantages of keeping slaves in good condition than from any humanitarian or ethical motives.<sup>57</sup> By the 1st Century B. C., this arrangement had so demonstrated its worth that *valetudinaria* for wealthy free-born citizens became common and are mentioned three times by Seneca.<sup>58</sup> In course of time some of these came to be large and well equipped institutions. In republican Rome, the care of the sick and wounded soldier was based upon the theory that "some knowledge of medicine was expected of every Roman citizen" (Allbutt).<sup>59</sup> After the Second Punic War, the wounded were carried by the *relites* to the rear, thence to tents or huts, where their wounds were bound, or else they were billeted in the houses of the wealthy, or sent to a safeguarded place, sometimes by wagon transportation.<sup>60</sup> As long as fighting was within the Italian peninsula and near Rome, it was possible to shelter the wounded in private homes, or fortified places or private hospitals like the above, and such retreats were called by the architect Vitruvius "*hospitalia*;"<sup>61</sup> but when warfare was carried into unknown and distant lands, among barbaric or semi-civilized peoples, some other arrangement had to be made. In the book of Hyginus on the munitions

<sup>56</sup> Haberling, pp. 65-67.

<sup>57</sup> M. Meyer-Steinag. *Jena med.-hist. Beitr.*, 1912, Heft., 3, 31-31. Cato the Censor (ii, 7) recommended that old and maimed slaves be sold, like worn-out oxen or utensils; unsaleable slaves were marooned on Tiber Island to starve.

<sup>58</sup> Meyer-Steinag., 32.

<sup>59</sup> Allbutt: *op. cit.*, 166.

<sup>60</sup> Livy, iv, 31.

<sup>61</sup> Vitruvius: *Architectura*, vi, 10. Cited by Haberling.

of camps,<sup>62</sup> provision is made for the location of two cohorts on either side of camp headquarters (*praetorium*) facing the main street, (*via principalis*); to the rear of the *praetorium* were the quartermaster's headquarters (*quaestorium*), and, on the right and left of this the *valetudinarium* or hospital for sick and wounded soldiers (*valetudinarii*), the veterinary hospital (*veterinarium*) and the blacksmith shops (*fabrica*), the latter far removed, so as not to disturb the patients.<sup>63</sup> The hospital was controlled by the camp commander (*praefectus castrorum*), and, according to Vegetius and the Digests, the hospital personnel consisted of hospital superintendents (*optiones valetudinarii*), the physicians (*medici castrorum*), the sanitary personnel (*capsarii*), who carried bandaging material in a pouch (*capsa*) and were attended by pupils (*discentes*), the paper-work personnel (*librarii*) and those who waited on the sick (*qui aegris praesto sunt*).<sup>64</sup> The digests specify inspection of hospitals (*valetudinarios inspicere*) as the duty of the tribunes. As noted by Briau, the hospital physicians and inspectors are commemorated in a number of inscriptions.<sup>65</sup>

Until the discovery of the legionary camp at Novaesium, on the Roman road to Cologne, near Bonn (Lower Rhineland), by Constantin Koenen,<sup>66</sup> evidence as to the existence of these military hospitals was merely on paper. Koenen's excavations (1887-1901) revealed, however, at the back of the *praetorium* and adjoining the quaestor's headquarters, the remains of a stone hospital, 90 by 50 meters in dimensions, built on the corridor plan, with entrances and exits so arranged as to avoid draughts in the wards, which opened into closed corridors and quadrangles, the dining room facing the main entrance and situated between the two main quadrangles. The 38 sick wards, each 18.2 meters square, were ranged along the full length of the outer wards and inner quadrangles and were probably intended for 5-6 patients each. The hospital would therefore accommodate about 198-220 patients.<sup>67</sup> Many surgical instruments and ointment boxes were found in the ruins, and the late Professor Haverfield found evidence of a good diet kitchen (oysters, meat, eggs) in the rubbish pit.<sup>68</sup> The fortress of Novaesium was originally established by Tiberius Caesar (14-37 A.D.) but the quarters were rebuilt in stone by Claudius (41-54).

In 1904, the legionary camp at Carnuntum, on the Danube, 40 km

<sup>62</sup> Hyginus: De munitione castrorum, Göttingen, 1843, p. 68.

<sup>63</sup> For the arrangement of a Roman camp, with plan, see, Haberling: Die Militärlazarette im alten Rom. Deutsche mil.-ärztl. Ztschr., Berl., 1909, xxxviii, 415.

<sup>64</sup> Haberling, *op. cit.*, 458-465.

<sup>65</sup> R. Briau: Le service de santé militaire chez les Romains, Paris, 1866, 24-41.

<sup>66</sup> C. Koenen: Beschreibung von Novaesium. Bonn. Jahrb., 111-112, pp 180-182.

<sup>67</sup> Haberling, 448-452, with plan. Meyer-Steinagel: *op. cit.*, 42-44.

<sup>68</sup> Albott, 488.

from Vienna, was discovered by Col. von Groller,<sup>69</sup> and in the statutory position behind the praetorium there were found remains of the original quadrangular camp hospital (1st century A.D.), 47.4 by 34.2 meters in dimensions, and an enlarged hospital of later date, covering 5,890 square meters, of which no less than 1,800 were devoted to an open central court.<sup>70</sup>

Both hospitals had the same arrangement of wards, opening upon corridors (parallel with the longer walls) and the central quadrangle. It is possible that the quadrangle, like the *patio* in a Spanish house, was a flower garden. There were wards on both sides of the corridors, and remains of sewers, water-piping, a heating plant, kitchen and apothecary's shop have been found. While only two surgical instruments were excavated, an inscription on the altar of the ward attendants (*capsarii*) indicates the true character of the building.<sup>71</sup>

In 1892-6, the imposing walls of a large structure at Baden (Switzerland), some distance from the old Roman camp at Vindonissa (Windisch), were excavated, the coins found being of the time of Claudius Caesar, and the large find of surgical instruments indicating a medical establishment. As Baden is described in Tacitus as a much frequented health resort and mineral spring,<sup>72</sup> Haberling assumes that this building was either a convalescent hospital or a supply depot, since it differs in plan from the hospitals at Carnuntum and Novaesium.<sup>73</sup> That many similar hospitals were put up for such large armies as the Romans maintained in Germany is highly probable.

### *Roman Military Sanitation*

The Romans left no treatises on military sanitation, but they were an instinctively clean people, and their concern for purity of food and water and for the disposal of sewage and excreta were not without their effect upon the hygiene of armies. Caesar, like Xenophon, paid great heed to rations and to the pitching of his camp upon a height at the head of a river, near wood and water. To camp in a valley was a barbaric custom (*consuetudo barbarorum*). The architect Vitruvius and the agriculturist Columella, both of the 1st Century A. D., had an intuitive feeling that marshes engender minute living creatures which might cause pestilential fevers. Vitruvius says:

The vicinity of a marsh is to be avoided, because, when the morning airs reach the house at sunrise, the mists of these places arrive with them, and the wind, mixed

<sup>69</sup> von Groller. *Der römische Limes in Oesterreich*, Wien, 1906.

<sup>70</sup> For plans of Carnuntum, see Haberling, 453, 455. Meyer-Steinig, 36.

<sup>71</sup> Haberling, 452-458. Meyer-Steinig, 35-42.

<sup>72</sup> "Locus amoenus saluberrimum aquarum usu frequens." Tacitus: *Historia*, i, 67.

<sup>73</sup> Haberling, 458.

with these vapors, spreads the poisonous exhalations of the creatures inhabiting the marsh, and so make the place pestilential. (I, 4.)

Columella says:

Nor should buildings be erected near a marsh nor a military road adjoin it, because through heat it gives forth noxious poisons and engenders animals around with dangerous stings, which fly at us in dense swarms. (I, 5.)

The mosquito net or canopy (*conopeum*) is ridiculed by Horace (Epodes, IX, 16) Juvenal (VI, 80) and Propertius (III, 11, 45). Vitruvius' treatise on architecture contains a careful survey of the diseases caused by bad water supply and exposure to the elements; recommends massive ingestion of water in constipation and calculus; the use of warm baths in gont, paralysis and the neuroses; and treats informingly of the quality of the air, climate, acclimatization, water-supply, filtration of water, mineral springs, the soil as a site for building, the hygiene and lighting of habitations and other buildings, the planning of towns and their water-supply.<sup>74</sup> That this view of architecture as a branch of sanitation (Lord Kelvin's view) was no mere sterile theory is evident from the actual remains of the spacious public buildings and military hospitals and the gigantic sewer-courses. The Roman scheme of physical training was not, as with the Greeks, a joyous, spontaneous *plein air* cult, but had the same rigorous practical tendency, and was concentrated on infantry and cavalry drill and tactics, held twice daily in the case of recruits, with such exercises as jumping, swimming, fencing, archery and equitation.<sup>75</sup> The gladiatorial shows, as Lecky maintains, were designed to harden the people to the bloody and brutal aspects of warfare as a primary function of the Roman state.<sup>76</sup> The most memorable picture of the Roman army as a mechanism of precision, in its most efficient period, comes from an unexpected source, namely, the Jewish historian Flavius Josephus (born 37 A. D.), who, originally a priest, had himself seen military service under Vespasian, and wrote as eye-witness:

Now here one cannot but admire at the precaution of the Romans, in providing themselves of such household servants, as might not only serve at other times for the common offices of life, but might also be of advantage to them in their wars. And, indeed, if any one does but attend to the other parts of their military discipline, he will be forced to confess, that their obtaining so large a dominion hath been the acquisition of their valour, and not the bare gift of fortune; for they do not begin to use their weapons first in time of war, nor do they then put their hands first into motion, while they avoided so to do in times of peace; but as if their weapons did always cling to them, they have never any truce from warlike exercises; nor do they stay till times of war admonish them to use them; for their military exercises differ

<sup>74</sup> A. Söllner: Die hygienischen Anschauungen des römischen Architekten Vitruvius. *Zeitschr. med. hist.*, 1913, Heft 4, 1-64.

<sup>75</sup> J. Marquardt & Th. Mommsen: *Handbuch der römischen Alterthümer*. Leipzig, 1884, V, 567.

<sup>76</sup> W. E. H. Lecky: *History of European Morals*.

not at all from the real use of their arms, but every soldier is every day exercised, and that with real diligence, as if it were in time of war, which is the reason why they bear the fatigue of battles so easily; for neither can any disorder remove them from their usual regularity, nor can fear affright them out of it, nor can labor tire them; which firmness of conduct makes them always to overcome those that have not the same firmness; nor would he be mistaken that should call those their exercises unbloody battles, and their battles bloody exercises. Nor can their enemies easily surprise them with the suddenness of their incursions; for as soon as they have marched into an enemy's land, they do not begin to fight till they have walled their camp about, nor is the fence they raise rashly made, or uneven; nor do they all abide in it, nor do those that are in it take their places at random; but if it happens that the ground is uneven, it is first levelled; their camp is also four square by measure, and carpenters are ready with their tools to erect their buildings for them.

As for what is within the camp, it is set apart for tents, but the outward circumference hath the resemblance to a wall, and is adorned with towers at equal distances, where between the towers stand the engines for throwing arrows and darts, and for slinging stones, and where they lay all other engines that can annoy the enemy, all ready for their several operations. They also erect four gates, one at every side of the circumference, and those large enough for the entrance of the beasts, and wide enough for making excursions, if occasion should require. They divide the camp within into streets very conveniently, and place the tents of the commanders in the middle, but in the very midst of all is the general's own tent, in the nature of a temple, inasmuch that it appears to be a city built on the sudden; with its market-place, and place for handicraft trades, and with seats for the officers, superior and inferior, where if any differences arise, their causes are heard and determined. The camp, and all that is in it, is encompassed with a wall round about, and that sooner than one would imagine, and this by the multitude and the skill of the laborers; and if occasion require, a trench is drawn round the whole, whose depth is four cubits, and its breadth equal.

When they have thus secured themselves, they live together by companies, with quietness and decency, as are all their other affairs managed with good order and security. Each company hath also their wood, and their corn, and their water brought them, when they stand in need of them; for they neither sup nor dine as they please themselves singly, but all together. Their times also for sleeping and watching, and rising, are notified beforehand by the sound of trumpets, nor is anything done without such a signal; and in the morning the soldiery go every one to their centurions, and these centurions to their tribunes, to salute them; with whom all the superior officers go to the general of the whole army, who then gives them of course the watchword and other orders, to be by them carried to all that are under their command; which is also observed when they go to fight, and thereby they turn themselves about on the sudden when there is occasion for making sallies, as they come back when they are recalled in crowds also.

Now when they are to go out of their camp, the trumpet gives a sound, at which time nobody lies still, but at the first intimation they take down their tents, and all is made ready for their going out; then do the trumpets sound again, to order them to get ready for the march; then do they lay their baggage suddenly upon their mules, and other beasts of burthen, and stand, as at the place of starting, ready to march; when also they set fire to their camp, and this they do because it will be easy for them to erect another camp, and that it may not ever be of use to their enemies. Then do the trumpets give a sound the third time, that they are to go out, in order to excite those that on any account are a little tardy, that so no one may be out of his rank

when the army marches. Then does the crier stand at the general's right hand, and asks them thrice in their own tongue, whether they be now ready to go out to war or not? To which they reply as often, with a loud and cheerful voice, saying, We are ready. And this they do almost before the question is asked them: they do this as filled with a kind of martial fury, and at the same time that they cry out, they lift up their right hands also.

When after this, they are gone out of their camp, they all march without noise, and in a decent manner, and every one keeps his own rank, as if they were going to war. The footmen are armed with breastplates and headpieces and have swords on each side, but the sword which is upon their left side is much longer than the other, for that on the right side is not longer than a span. Those infantrymen also that are chosen out from the rest to be about the general himself, have a lance and a buckler, but the rest of the infantry have a spear, and a long buckler, besides a saw and a basket, a pickaxe, and an axe, a thong of leather, and a hook, with provisions for three days, so that an infantryman hath no great need of a mule to carry his burdens. The cavalry have a long sword on their right sides, and a long pole in their hand; a shield also lies by them obliquely on one side of their horses with three or more darts that are borne in their quiver, having broad points, and not smaller than spears. They have also headpieces, and breastplates, in like manner as have all the infantry. And for those that are chosen to be about the general, their armor no way differs from that of the horsemen belonging to other troops; and he always leads the legions forth to whom the lot assigns that employment.

This is the manner of the marching and resting of the Romans, as also these are the several sorts of weapons they use. But when they are to fight, they leave nothing without forecast, nor to be done off hand, but counsel is ever first taken before any work is begun and what hath been there resolved upon is put in execution presently; for which reason they seldom commit any errors, and if they have been mistaken at any time, they easily correct those mistakes. They also esteem any errors they commit upon taking counsel beforehand, to be better than such rash success as is owing to fortune only; because such a fortuitous advantage tempts them to be inconsiderate, while consultation, though it may sometimes fail of success, hath this good in it, that it makes men more careful hereafter; but for the advantages that arise from chance, they are not owing to him that gains them; and as to what melancholy accidents happen unexpectedly, there is this comfort in them, that they had however taken the best consultations they could to prevent them.

Now they so manage their preparatory exercises of their weapons, that not the bodies of the soldiers only, but their souls, may also become stronger; they are moreover hardened for war by fear, for their laws inflict capital punishments, not only for soldiers running away from their ranks, but for slothfulness and inactivity, though it be but in a lesser degree; as are their generals more severe than their laws, for they prevent any imputation of cruelty toward those under condemnation, by the great rewards they bestow on the valiant soldiers; and the readiness of obeying their commanders is so great, that it is very ornamental in peace; but when they come to a battle, the whole army is but one body, so well coupled together are their ranks, so sudden are their turnings about, so sharp their hearing, as to what orders are given them, so quick their sight of the ensigns, and so nimble are their hands when they set to work, whereby it comes to pass, that what they do is done quickly, and what they suffer they bear with the greatest patience. Nor can we find any examples where they have been conquered in battle, when they came to a close fight, either by the multitude of the enemies, or by their stratagems, or by the difficulties in the places they were in, no, nor by fortune neither, for their victories have been surer to

them than fortune could have granted them. In a case, therefore, where counsel still goes before action, and where, after taking the best advice, that advice is followed by so active an army, what wonder is it that Euphrates on the east, the ocean on the west, the most fertile regions of Libya on the south, and the Danube and the Rhine on the north, are the limits of this empire? One might well say, that the Roman possessions are not inferior to the Romans themselves.<sup>77</sup>

*Public Works Performed by the Roman Army*

Until very recent years, little has been known of the streets, sidewalks, gutters, sewers, drains, cesspools, public fountains and water-courses of the great cities of antiquity.

The wide well-paved streets and sidewalks, the sewers and stone privies found by Place at Khorsabad (720 B. C.), the gigantic drains and sewers of Babylon, a city twice the size of London, the model arrangements of streets and sanitary features of Priene (Greece) and Pompeii (Rome) have been the admiration of all visitors at museums and sanitary expositions, and in these matters Rome yielded to none. The rules for the construction of its streets were writ large in the Laws of the Twelve Tables. Macadamized embankments with sidewalks were introduced by Appius Claudius (312 B. C.). The general paving of streets in the city and macadamizing of roads was pushed with remarkable energy in 174 and street-cleaning under four aediles was established by the *lex municipales Julia* of Caesar (45 B. C.). The Cloaca maxima, frequently clogged with refuse but always cleaned again with Roman energy, eventually disposed of the entire sewage, and by 315 A. D., there were 144 public latrines and 116 *necessariae* along the Aurelian Wall.<sup>78</sup> A similar arrangement has been found in the Roman military station at Tingad in the Sahara (Boissier).<sup>79</sup> The manner in which these public works were carried out all over the vast empire is germane to our subject.

The ruling principle of the Roman army was that no man should be kept idle. Discipline was the strictest conceivable. Desertion, cowardice in battle and insubordination were punishable by death, executed either by soldiery or the imperial lictors; whole commands were decimated by drawing lots and deserters to the enemy were thrown to wild beasts.<sup>80</sup> Under this harsh régime, the whole army was utilized in time of peace for the construction of public works, and it is of record that the walls and fortifications on the boundary of the empire and in Britain, the many military roads, all forts, barracks and military hospitals, many temples and public buildings, as well as canals, bridges, sewers and water-courses were constructed by Roman soldiery, under the direction of technicians. Mining, as well as the dredging of harbors and the drainage of swamps were also part of this duty, in fact, the general sanitation of the empire was largely the work of the army.<sup>81</sup>

<sup>77</sup> Josephus, *Bellum Judaicum*, iv, 5. Translation of William Whiston.

<sup>78</sup> H. A. Nielsen, *Die Strassenhygiene im Altertum*. Arch. f. Hyg., München & Berlin, 1902, xlvii, 85-115.

<sup>79</sup> G. Boissier, *L'Afrique romaine*, Paris, 1893. F. W. Hall, *Tingad, The Pompeii of Algeria*, *Discovery*, Lond., 1921, ii, 292.

<sup>80</sup> Marquardt & Mommsen, *op. cit.*, p. 571-573.

<sup>81</sup> Marquardt & Mommsen, *op. cit.* 568-571.



How an empire so wonderfully organized could have fallen has exercised some of the best wits since Gibbon's time. Gibbon wrote the *Decline and Fall* to prove that the growth of Christianity was the efficient cause, but his famous sarcasm about the early Christians, that "their aversion to an active life contributed rather to excuse them from the service than to exclude them from the honors of the state and the army"<sup>52</sup> has long since gone up in smoke. The forward-looking emperors, beginning with Augustus Caesar, appear to have recognized that an empire so constituted as the Roman could not run forever, and relied mainly upon the Army to keep things going. Such a mechanism was, in fact, like a clock wound up to run a certain length of time and predestined to run down after a definite interval. That the empire should have lasted full 500 years, that Roman history covers 1,200 years, is the surprising thing. Very interesting it is to read in Suetonius of the keen desire of Augustus that the ancient traditions of republican Rome should be maintained, of his private consultations with the magistrates, the Senate and Tiberius as to the condition and future chances of the empire, of his long period of mourning for the lost legions of Varus, destroyed in the German wars;<sup>53</sup> and while most of the emperors from Augustus down were of the "sexual-intellectual" type so dangerous to modern states,<sup>54</sup> the best of them were exemplars of that union of strength and sagacity, of firmness and mildness, which made the name of Rome everywhere respected. Of the ultimate decadence of manners and morals the third satire of Juvenal tells more than enough. Wells scores a number of strong points: the childlike delight in cruelty, as if "the misshapen hairy paw" of Neanderthal man were thrust at us by a morning caller; the mental infantilism which cultivated augury, ignored geography and snubbed science and medicine; the "rich man's culture" of the imperial city which was only veneer; the consequent apathy of the population to the vices of the Caesars and the invasion of the barbarians; the steady depopulation of the empire,<sup>55</sup> all which had more to do with the dissolution of the mercenary army than the attitude of the early Christians. The Roman nobles of the decline did not even trust the barbarians they had hired to guard their frontiers. The

<sup>52</sup> Gibbon: *Decline and Fall of the Roman Empire*, ch. xv.

<sup>53</sup> Suetonius: *Divus Augustus*, 23-25, 28, 31, 35-40, 73, 98.

<sup>54</sup> The most striking example is Tiberius, the tiger cut on the throne, who used the *lex de maiestate* to destroy many of the best of the Roman aristocracy and whose sordid vices at Capri are untranslatable. A youth of sensible character and behavior, Tiberius lived to see his own mother taken from his father by Augustus and was later required to divorce his wife, to whom he was deeply attached, in order to marry the same emperor's dissolute daughter. Brooding over these tyrannies undoubtedly did much to produce the cryptic mind which made no man's life safe while Tiberius reigned. The splendid head, of the busts in the Naples Museum, tells of his vast administrative ability, the eyes, even in the cold stone, are those of a wild animal.

<sup>55</sup> Wells: *Outline of History*, ch. xxvi, xxviii.

execution of Stilicho at Ravenna gave Alaric his opportunity; what followed was but a foregone conclusion. But even as the Greek civilization is our best intellectual heritage, so republican Rome has been the world's great school for the development of manly character, of the centric idea that virtue derives from *vir*, a man. In the words of Thoreau:

The fact that the Romans once inhabited her reflects no little dignity on Nature herself; that from some particular hill the Romans looked out on the sea. She need not be ashamed of her children

*(To be continued)*



## THE RESTORATION OF THE INTERNAL TABLE IN CRANIOPLASTY

By ADOLPH M. HANSON, M. D., Drs. HAESSLY, HANSON AND TRAEGER  
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IT IS generally conceded that preference should be given to the autograft over the heterograft in operations for the repair of skull defects. The indications for skull repair are rather obscure, but operation is justifiable in large pulsating defects with marked deformity.

Let us for a moment consider the existing condition in an old cerebral injury with a pulsating defect over a "live area." For the sake of illustration we may consider a defect over the motor area. Below the defect we have a scarred brain with, perhaps, adherent membranes. If no cyst is present, this healed portion of the brain, on stooping or exertion, is forced into the defect with the following result: A certain amount of edema, more or less, is constantly present, and any condition, as epilepsy, spasticity, etc., is aggravated. This is not so noticeable in cases with very small or very large defects, but in those where the defect is large enough to permit of a pinching of the brain tissue, the convexity of the brain tissue when forced into a defect of 3 or 4 cm. by 6 cm. is very marked, whereas in a large defect the convexity is only slight. The more marked the convexity, the tighter is the pinching process, and the resulting injury and edema of the part involved proportionately greater.

In heterografts where silver, or celluloid, or any other substance is used, the "man-hole" has simply been given a cover. The defect of the internal table and its space above (5 to 8 mm.) still affords an internal hernia into which the brain may be forced under conditions which increase the intra-cranial pressure. In this manner a chronic localized cerebral edema may be only slightly benefited, or not at all.

The autograft of costochondral cartilage that is one-half to two-thirds the thickness of the normal rib<sup>1</sup> restores the normal thickness of the bony covering and prevents all possibility of pinching. With the internal table restored, a chronic localized cerebral edema will gradually subside.

During the last thirty months the writer has operated upon five cases of defects of this type with results that exceeded the most optimistic expectations. The most recent of these operations was performed eight months ago.

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<sup>1</sup>The Costochondral Graft for the Repair of Skull Defects. THE MILITARY SURGEON, Vol. XLVIII, page 691, June, 1921.

## PROGNOSIS OF PULMONARY TUBERCULOSIS

By GEO. H. CROFTON, M. D.

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MOST textbooks on pulmonary tuberculosis fail to emphasize the great importance of prognosis. It is the purpose of this paper to call attention to the paramount factors that should be considered in advising the patient as to his ultimate outlook and chances of recovery, as these are the questions he will ask when a definite diagnosis of pulmonary tuberculosis has been made.

The prognosis in pulmonary tuberculosis must be carefully individualized and the various factors in favor of the patient and against him given due consideration. The formation of a definite prognosis is often attended with great difficulty by virtue of the divergent significance attached to special symptoms and the elasticity of their interpretation. An accurate prognosis seldom can be made upon the basis of the physical condition alone.

The following factors should be considered in making a prognosis: (1) Activity of the process revealed by the constitutional symptoms and physical findings; (2) form of the disease; (3) extent of the lesion in the lungs; (4) presence of complications.

In cases with a sudden onset the prognosis is worse than in those in whom the disease came on insidiously.

The most unfavorable cases are those showing marked constitutional symptoms which are out of proportion to the findings on physical examination.

*Temperature:* The higher the morning temperature, the nearer it approaches the evening temperature, the worse the prognosis. Persistent high temperature that does not yield to clinical effort is an element of fatal prognosis.

*Pulse:* Tachycardia is an indication of the acuteness of the process, low resistance or both. An undue acceleration of the pulse, independent of fever or other obvious causes, must be regarded as an unfavorable moment.

*Blood Pressure:* Those with hypertension have a better outlook for recovery than those showing hypotension; low blood pressure is characteristic of feeble heart action due to tuberculous toxemia acting unfavorably on the cardiac muscle. So long as the blood pressure remains low the prognosis is serious.

Persistent anorexia and gastro-intestinal disturbance is of grave prognostic significance. Gain in weight and a good appetite are favor-

able signs. A progressive diminution of body weight, despite the existence of other features of favorable significance, must be considered as a factor of ill omen.

In the pulmonary form of military tuberculosis the chances of recovery are nil. Acute pneumonic phthisis, the prognosis is unfavorable. Other features being equal, a limitation of the disease at one apex is of more favorable significance than a bilateral.

*Prognostic significance of complications:* Laryngeal involvement may become chronic, arrested, or the patient may die in from six to eight months. In the majority of cases, hemoptysis has no influence on the course and prognosis of the disease.

Intestinal tuberculosis aggravates the prognosis. Empyema is a bad complication. Spontaneous pneumothorax is fatal in 95 per cent of cases within one month of its occurrence. Tuberculosis of the kidney is of unfavorable import.

A cavity has been defined as a tuberculous abscess which is drained through a fistulous opening into a bronchus. A pulmonary cavity is proof that the organism is in possession of strong powers of resistance, in fact, of immunity; otherwise the lesion would spread. Nearly one hundred years ago Laennec spoke of cavity formation. He said:

Pretty often, at the period when the complete evacuation of a tuberculous cavity is indicated by the stethoscopic sign, the patient experiences a marked improvement in his symptoms; the expectoration and fever decrease, and if the improvement only lasts a little while, even the wasting of the body is sometimes diminished. This false convalescence is usually only of a few days or weeks duration; but it may extend to some months, and may even seem to be complete. . . . It may even, in some rare instances, terminate in a perfect and permanent restoration of health.

The dangers of tuberculous cavities vary inversely with the time it takes for their formation. The sooner they are produced the worse the prognosis; the slower they develop the better the ultimate outlook, and in chronic phthisis, even with extensive excavation, are compatible with a long and efficient life. The cavities are surrounded by dense fibrous capsules which limit their extension, draining through a fistulous tract communicating with bronchi. The cavity may heal and, when small, may be obliterated by granulation or by calcification of its contents. Patients should be advised that cavities in their lungs are not so dangerous as they believe. They may live and can be active with cavities for many years.

*Temperament:* Favorable factors influencing prognosis are a phlegmatic attitude, gentleness of disposition, alertness of intellect, and strength of will. High degree of irritability presents serious obstacles

to a successful issue. Inmate cheerfulness of disposition modifies prognosis to an enormous extent, as the time element in the arrest of the disease makes unceasing call upon the patience and hopefulness of the patient. The optimism of the cheerful and sanguine is a more favorable factor influencing prognosis than the pessimism of the depressed and melancholic.

Prognosis is not different in tuberculous adults who are derived from phthisical parents than those who are not.

Pregnancy is a grave complication of phthisis. During pregnancy the patient may feel well, even better than before conception has taken place. But after childbirth there is often a reactivation of the tuberculous process, and an acute course of the disease is likely to ensue.

Age constitutes an important consideration in the prognosis of tuberculosis. As a rule, the very young and the old do badly. Prognosis is best in early adult life.

With regard to sex, there are decidedly better results among females than males, and in women unmarried than in those who are married.

Race has been found to exercise a considerable influence upon the prognosis. In the negro the morbidity of tuberculosis is explained in part by an undue racial predisposition. The course of the disease is usually rapid, attended by progressive excavation, and marked by a high degree of toxemia. The mortality of the disease among the American Indians is due to their utter lack of resistance. Prognosis among the Irish is less favorable than in any other Caucasian race. The Hebrew, though quite susceptible to infection and unable frequently to overcome the tuberculous process, exhibits powers of resistance which are marvelous, despite the existence of extensive areas of destructive change.



## OUR RESPONSIBILITIES

By CAPTAIN MILTON H. EPSTEIN, M. A. R. C.<sup>1</sup>

THE declaration is often made by many of those who served as medical officers with the armed forces of this country during the recent emergency, that their experience in the service held nothing of professional value for them but that, on the contrary, the time thus spent was practically wasted from the standpoint of scientific benefit.

The demands made upon the medical officer by the pressing needs of warfare were necessarily such that the specialist was frequently removed from any opportunity to practice in his chosen field for the entire term of his service. Likewise the laboratory research man, the medical recluse, obviously did not find either the practical aspects or the necessarily standardized methods of the medical department conducive to the development of his abstract medical philosophies and theories.

We must, however, recognize that "Military Medicine" of necessity comprehends, in addition to the scientific or professional side, an administrative component; and while the temporary medical officer was in many instances notoriously unsympathetic and impatient with what he chose to consider a restrictive influence upon the exercise of his professional qualities in this latter relation, the unusual discipline and forced adherence to a general program was a training in coordination that is capable of being capitalized to great advantage in his peacetime practice in matters widely affecting the public health.

The initially quoted dissatisfaction is, therefore, to say the least, debatable as to its justification, inasmuch as without the advantage of his war-time service the civilian physician would have been denied the opportunity of observing at close range the wholesale treatment of sanitary problems, and the organization and administration of protective and relief measures of such proportions as may conceivably be indicated in peace time for the adequate control, for example, of sudden, far-reaching epidemic conditions. If, therefore, we have not deadened our sensibilities to the impressions gained in the service, the organization of a campaign for disseminating impersonal medical propaganda of an educative nature can now be undertaken with a minimum of delay and with infinitely greater efficiency as a result of our temporary intimacy with the medical side of the war machine, and consequently our experience can hardly be termed valueless.

The Medical Department of the Army needs no defense, and none is intended, the purpose of this article being solely that of urging former

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<sup>1</sup> Formerly on Administrative Staff, U. S. Army General Hospital No. 9, Lakewood, N. J.

medical officers not to forget the lessons of organization gained in the service and likewise not to fail in their application of these lessons to the administrative features of sanitary emergencies. There can be nothing unethical in the organization of the medical profession to the end that the distribution of wholesome medical propaganda be made as effective as possible, or in the matter of issuing an adequate warning against, for instance, the lurking danger of the chiropractor who, while he could serve a splendid purpose under the direction of a qualified medical man, undertakes to make general diagnoses without the necessary qualifications to do so, and consequently manipulates a tubercular spine with the utmost nonchalance and without any appreciation of the engendered result.

The need for surrounding the public with the media of competent medical advice has never been greater than at this moment, and the adequate combating of medical quackery is impossible if handled sporadically. Furthermore, the destructive efforts of professional obstructionists to provenly successful immunizations, etc., must be met with concerted strength if the great medical and surgical lessons of the war are to bear the fruit which can alone atone for the cost at which they were obtained.

It is here that the medical reserve officer, no longer in active service, can be of inestimable value in building up in his community through individual effort, and in larger units through medical associations, a species of medical morale that may be trained to react to and effectively cooperate with government and other competent and authoritative efforts in instances of local, statewide or national emergencies affecting the public health.

A recognition of the importance of promoting a spirit of cooperation between the regular army officer and the civilian holding a reserve commission has recently been voiced by the formation in San Francisco of an association of officers of the three component parts of the Army of the United States, namely, the Regular Establishment, the National Guard, and the Organized Reserves wherein, under the direction of Maj. Gen. Hunter Liggett, retired, as head of the Operations Committee, close contact and the study of technical problems will be fostered among officers of the various arms and staff corps of the Army, and it is confidently expected that such close and regular contact between the medical officers of the Regular Establishment, of the National Guard and the civilian physician who holds a commission in the Reserve Corps, will be productive of a spirit of understanding and cooperation between those forces that may be capable of valuable utilization under any one of many conceivable situations not necessarily arising from the conditions of actual warfare.



Inasmuch as this matter is, therefore, one that might be of interest in other military subdivisions of the country, there is quoted herewith that portion of the constitution of the Association of the Army of the United States that relates to the reason for its creation:

The objects and purposes of the Association of the Army of the United States are to promote the spirit of patriotism, to foster the best traditions of the profession of arms, to further the one army spirit, and to strengthen the bonds of comradeship among the officers of the military forces of the United States; to encourage and facilitate among ourselves the study of American history and military art in their relation to the common defense of our country, and to transmit an interest in and a knowledge of the same to our successors.

An honest contemplation of our national responsibilities must surely convince us of the importance of fostering every responsible agency that gives promise of promoting a better understanding, both professionally and socially, between the medical officers of the Regular Establishment and the civilian physician who may be called upon to augment the Medical Department of the Army in times of emergency.



# CRITIQUE OF THE ARMY RATION, PAST AND PRESENT

By LIEUTENANT COLONEL JOHN R. MERLIN  
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## EVOLUTION OF THE U. S. ARMY RATION

THE proper feeding of an army, and particularly an army in campaign, is a problem in transportation rather than a problem in physiology. Nevertheless, the nutritional welfare of an army cannot be safeguarded without proper attention to the physiological value of the food supplied and its sanitary care. The present chapter is an attempt to judge the nutritive efficiency of the army ration, as a basis of feeding troops in training, in the light of the knowledge gained from the nutritional surveys and dietary studies made during the war.

As an introduction, the evolution of the ration and of the system of feeding the United States Army will be traced briefly.

The ration of an army naturally reflects the dietary habits of the people from which the army is drawn. The number of articles composing the ration in like manner reflects the variety of foods available. From this standpoint alone the later rations officially adopted by the U. S. Army show how much the dietary habits of the country have improved since revolutionary times.

Until modern times, however, it is certain that the ration prescribed has not been considered as the sole source of nourishment. The word "ration" in fact connotes a limited amount of food. Foraging, sutling, and accessory feeding by gifts of friends have, in whole or in part, been counted upon in the past to assist in keeping the soldier contented with his lot. In the first articles of war adopted by the Continental Congress it was provided that:

All officers, soldiers and sutlers shall have full liberty to bring into any of the forts or garrisons of the United American States, any quantity or species of provisions, eatable or drinkable, except where any contract or contracts are or shall be entered into by Congress or by their order for furnishing such provisions.<sup>1</sup>

The soldiers' actual dietary has from the beginning, therefore, not been so limited as the small number of articles in the ration provided by the Government would indicate. It is necessary to make this clear at the start, for, while the tendency in the army today, more than ever before, is to provide the soldier everything he requires, it was a matter of surprise to the great majority of civilians brought into the army

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<sup>1</sup> *Journal of Congress*, September 20, 1776, Articles of War, Section VIII, Art. 2.

during the World War to learn that army rationing did not of necessity mean limited feeding. As a matter of fact, the army ration as written has never represented more than what, for the times, was regarded as bare necessities of diet. The chief difference in this regard between rationing in the early days and in recent times lies in the fact that the supplementary articles necessary for the health and contentment of the soldier were formerly acquired fortuitously, to put it mildly, while at and before the period of the World War express provision was made, by the ration savings privilege (which will be discussed later), for the mess to serve almost anything which the soldier might desire to eat. The bare necessities for army use are concentrated or heavy foods, while the supplementary articles are chiefly fresh vegetables and fruits. Even in colonial times the importance of these articles was conceded, for in the resolutions establishing the duties of the commissary department it was provided:

XVI. That the Deputy-Commissaries-General of Purchase take special care to procure full supplies of vegetables, as being essentially necessary to the "health of the army."<sup>2</sup>

#### DIFFICULTIES DURING THE PERIOD OF THE REVOLUTIONARY WAR

From the standpoint of availability of supplies for the proper rationing of troops, the Revolutionary War might be described as the starvation period.

On December 23, 1777, Washington wrote:

I am now convinced without a doubt that unless some great and capital change suddenly takes place in that line, this army must inevitably be reduced to one or other of these three things: starve, dissolve or disperse in order to obtain subsistence in the best manner they can . . . the commissary has not a single hoof of any kind to slaughter and not more than twenty-five barrels of flour . . . he could not tell when to expect any. All I could do under these circumstances was to send out a few light parties to watch and harass the enemy whilst other parties were instantly detached different ways to collect, if possible, as much provision as would satisfy the pressing wants of the soldiery. . . . The present commissaries are by no means equal to the execution of the office. . . . To this I am to add that, notwithstanding it is a standing order, and often repeated that the troops shall always have two days' provisions by them that they might be ready at any sudden call; yet an opportunity has scarcely ever offered, of taking an advantage of the enemy, that has not been either totally obstructed or greatly impeded on this account.<sup>3</sup>

The following is quoted from a revolutionary army surgeon:<sup>4</sup>

<sup>2</sup> Journal of Congress, June 10, 1777. Quoted in "Legislative History of the Subsistence Department," by John H. Barringer, Commissary of Subsistence, Washington, 1877, p. 13.

<sup>3</sup> Letters of Washington to President of Congress.

<sup>4</sup> Diary of Dr. Abigence Wadso (surgeon from Connecticut), 1777-1778.

Dec. 14, 1777. Poor food—hard lodging—cold weather—fatigue—nasty clothes—nasty cookery: vomit half my time . . . A pox on my bad luck. Here comes a bowl of beef soup—full of burnt leaves and dirt, sickish enough to make a Hector spue—away with it, boys—I'll live like the Channelion upon air.

Dec. 18, 1777. Rank and Precedence make a good deal of disturbance and confusion in the American Army. The Army is poorly supplied with provisions, occasioned, it is said, by the neglect of the Commissary of Purchases.

Dec. 21, 1777. A general cry through the Camp this evening among the Soldiers—"No Meat—No Meat." What have you for dinner, boys? "Nothing but Fire Cake and Water, Sir." At night—"Gentlemen, the supper is ready." What is your supper, Lads? "Fire Cake and Water, Sir." What have you got for breakfast, Lads? "Fire Cake and Water, Sir." The Lord send that our Commissary of Purchases may live on Fire Cake and Water!

That this condition of supplies was by no means confined to brief seasons may be inferred from the following:

There is at this time an alarming scarcity of bread and forage, and though it may be in a great measure artificial, yet there are symptoms of its being in some degree real.<sup>5</sup>

I have also taken the liberty to press the states above mentioned to use the most vigorous exertions in procuring supplies of provisions, especially of flour, by the want of which I fear we shall be much embarrassed.<sup>6</sup>

I am in the hope of getting a good man at the head of the commissaries without which I foresee we must starve . . . Militia have eaten up everything . . . We are living upon charity and subsist by daily collections. Indian meal and beef is our common diet, and not a drop of spirits have we had with us since I came to the Army.<sup>7</sup>

For a fortnight past the troops, both officers and men, have been almost perishing for want. They have been alternately without bread or meat the whole time, with a very scanty allowance of either and frequently destitute of both . . . "The distresses we feel are chiefly owing to the early commencement and uncommon rigor of the winter, which have greatly obstructed the transportation of our supplies." Various reasons "have determined me to call upon the respective counties for a proportion of grain and cattle to satisfy the present exigency."<sup>8</sup>

Such were the financial embarrassments of Congress and the depreciation of the Continental currency that a new plan was adopted for procuring supplies for the army. Specific quantities of flour, meat and other articles were apportioned to each state. These were to be collected, deposited and delivered at such places within the states respectively as the Commander in Chief would designate. The scheme

<sup>5</sup> George Washington to Committee of Congress, January 15, 1779.

<sup>6</sup> George Washington to President of Congress, West Point, October 1, 1779.

<sup>7</sup> Letter of Gen. Nathaniel Greene. Camp on the Pedee, January 9, 1781.

<sup>8</sup> George Washington to the Magistrates of New Jersey, January 8, 1780. From Morristown, N. J.

proved very defective in practice as no times were specified for depositing the articles and there was no penalty for neglect.<sup>9</sup>

The last quotation, as well as the one from General Greene, indicates where the chief difficulty lay, namely, in the Commissary Service. Congress apparently was reluctant to confer sufficient authority on the Commissary General; at all events, the first Commissary General, John Trumbull, resigned his commission August 2, 1777, because, as he says, "I cannot sacrifice my honor and my principles."<sup>10</sup>

One chief objection to the system prevailing through the early part of the Revolutionary War was the fact that a commissary general received a commission on all disbursements for the army. On the first of January, 1780, this was remedied by granting a salary of \$40,000 per annum.<sup>11</sup> Purchasing commissaries, however, continued to receive an allowance based upon the amount of money disbursed. The system gave so much dissatisfaction that it was eliminated entirely in 1781, and the duties of the commissariat transferred to the head of the Treasury Department. This change preceded the termination of the war by only a few months. Thenceforth, until after the war of 1812 had proved the inadequacy of the new system, the army was supplied by contractors who dealt directly with the Treasury Department.

Soldiers in military hospitals during the Revolutionary War were fed in part on the ration and in part on provisions donated from civilians, thus: "We cannot feed a man sick with fever on the soldier's ration and we are forbidden to draw anything else," complains a regimental surgeon.<sup>12</sup> From a hospital at Burlington, Vt., came the statement that "no culinary process was performed at the hearth of the sick wards."<sup>13</sup> A more permanent hospital, however, seemed to enjoy greater independence. Thus from William Shippen's first draft of a plan for the organization of a military hospital we read:

A commissary, whose duty shall be to procure, store and deliver provisions, *forage* such articles as the Director shall judge necessary

<sup>9</sup> 1789. Sparks' note.

<sup>10</sup> General Trumbull in a letter addressed to Congress under date of July 19, 1777, gave the reasons for his resignation as follows: "In my humble opinion, the head of every department ought to have control of it. In this establishment, an *imperium in imperio* is created. If I consent to act, I must be in continual variance with the whole department and of course be in hot water. I must turn attester and be continually applying to Congress, and attending with witnesses to support the charges, or, must sit down in ease and quiet, let the Deputies do as they like, and enjoy a sinecure. The first situation I cannot think of; the last I never will accept. It never shall be said that I was the first American pensioner. I am willing to do and suffer for my country, and its cause, but I cannot sacrifice my honor and my principles. I can by no means consent to act under a regulation which, in my opinion, will never answer the purpose intended by Congress, nor supply the Army as it should be."

<sup>11</sup> Legislative History of the Subsistence Department of the U. S. Army from June 16, 1775, to August 15, 1876, by John W. Barriger, page 23.

<sup>12</sup> From Brown, H. E.: "The Medical Department of the U. S. Army, 1775-1873," p. 13.

<sup>13</sup> From Brown, H. E.: "The Medical Department of the U. S. Army, 1775-1873," p. 90.

for ye use of ye hospitals in the purchase of which he shall frequently consult with and be regulated by the prices of the Quartermaster and Commissary Generals . . . A steward for every 100 sick who shall receive from ye commissary provisions, distribute them agreeable to ye orders of the General or Physician and Surgeon General of his department and be accountable to ye commissary for ye same . . . a matron to every 100 sick who shall see the provisions are properly prepared.<sup>14</sup>

Also, by resolution of the Continental Congress, it was provided that a steward shall be appointed for each hospital "whose duty it shall be to purchase *vegetables and other small articles*"<sup>15</sup>. . . the implication being that the basic or bare-necessity articles were provided from the commissary stores.

Not only the flavor but the actual remedial value of fresh vegetables was appreciated, for the Congress also provided that the medical commissary "be directed to provide sufficient quantities of antiscorbutics for the use of the hospitals in the northern army," and that "a suitable spot of ground for a garden be enclosed in the neighborhood of the general hospital to supply the army with vegetables and that laborers be hired to cultivate it under the direction of an overseer, to be appointed by the general or commanding officer."<sup>16</sup>

#### NUTRITIVE VALUE DURING REVOLUTIONARY PERIOD

Knowledge of the composition of foods in the latter part of the eighteenth century was of course practically nil. Chemistry as a science had just been born. Lavoisier, who was beheaded in the French Revolution, had not yet performed his famous calorimetric experiments. Hence the table of equivalents for a ration "of all species," which appears under the winter ration established by order of General Washington, must not be construed as an attempt to state the relative nutritional value of the different articles, but an attempt to equalize the money values.

It is singular how nearly the prescribed rations of that time came to the actual energy requirements of soldiers as it is known today. The average amount of food supplied to the 427 messes studied by nutritional survey parties during the World War was 3,899 calories. The value of the first ration authorized by law (November 4, 1775), assuming similar composition to the articles of the same names, was 3,876 calories. The winter ration established by General Washington made an allowance of 300 calories more, which, as we have seen in the previous chap-

<sup>14</sup> From *Annals of Medical History*, vol. 102, Section of Hospital Feeding.

<sup>15</sup> *Journal of Continental Congress*, September 30, 1780.

<sup>16</sup> *Journal of Continental Congress*, November 29, 1776.

ters, was sufficient for winter weather in the training camps during the World War. With food as scarce as it was in the Revolutionary War, no special propaganda was necessary to avoid waste. Mess efficiency in the Continental Army, in this sense, was probably quite as high as in our modern camps.

(d) FIRST PEACE-TIME RATION

Following the Revolutionary War, the army speedily dwindled away until in 1785 it consisted of only one regiment of 780 men. Judging by the amount of food provided in the ration of 1785, the soldiers had very little work to do, although, as we shall see presently, in connection with frontier service it is certain that supplementary foods were available, whether by purchase from the soldier's pocket or by other means.

The noteworthy feature of this first peace-time ration is the occurrence of rum as a component article. In the previous ration rum is mentioned only as the equivalent of eight times as much spruce beer. One gill of rum or one quart of spruce beer was regarded as the equivalent of a half pint of rice or a pint of Indian (corn) meal. The reason for an extra allowance of food for frontier service was not alone the extra labor involved, but the fact that supplementary articles of diet were not so readily available in isolated posts on the frontier.

The ration consisted of nothing but meat, bread, rum, and seasoning materials (salt and vinegar) until after the war of 1812. One important enactment was made in this period, however, which, had it not been repealed, would probably have spared much suffering in that war, namely, the principle of commutation of rations. The law of April 30, 1790, specifically provided that "every noncommissioned officer, private, and musician, should receive daily the following rations . . . or the value thereof at the contract price where the same shall become due."

This was reenacted in the law of March 3, 1785, but was repealed May 30, 1796. Had the privilege of commutation or, as it has become known in modern times, the privilege of ration savings, been in vogue during the war of 1812, the soldiers would have exercised their instinctive desire for fresh foods and much illness would have been averted.

It is noteworthy that the amount of beef and the amount of bread, "or flour," prescribed in the ration of 1798 have persisted to the present time, notwithstanding the fact that numerous other articles have been added. Those who defend every jot and tittle of the old law, on the theory that change or correction means deprivation of the soldier, should be called upon to demonstrate that soldiering today calls for a greater expenditure of energy than it did in the rugged days of the fron-

tiersman. The 20 ounces of beef had its origin in the additional 4 ounces provided in 1794 for the soldier on duty at the frontier. At first this extra allowance was made only under "special circumstances." By the law of March 3, 1795, the extra allowance was reduced, but was made obligatory for *all* soldiers on the frontier without specification of duty. Besides making the extra allotment of meat permanent, the law of 1798 raised also the allowance of rum to one gill. The next year, however, this was reduced again to a half-gill, and its use by the soldier was placed at the discretion of the commanding officer.

(c) THE RATION OF 1812

The ration which prevailed in the war of 1812 was authorized by enactment of March 16, 1802. The only change from the ration of 1799 was in again making rum obligatory and increasing the amount once more to a gill. In 1804, however, an act was passed providing that "an equivalent in malt liquors or low wines may be supplied the troops of the United States, instead of the rum, whiskey or brandy. . . and at such seasons of the year as in the opinion of the President of the United States it may be necessary for the preservation of their health." With this change the law of 1802 was reenacted January 17, 1812, and continued in force with slight modification until 1832.

The nutritive value of the 1812 ration was not so high as the 1775 ration, but was very much higher than the peace-time ration prevailing in the interim between the two wars. It was, in fact, essentially the peace-time frontier ration adopted in 1794.

The year of 1818 was significant for two important events in connection with the army ration. In this year, following the Seminole War, Jackson recommended that, for troops serving in a southern climate, molasses (for the manufacture of spruce beer) should be issued in place of whiskey, and that the ration should be improved by the addition of one-half pint of beans, peas or rice. This recommendation was the beginning of the end of alcoholic liquor as a regular component of the ration, for under date of December 15 of the same year, John C. Calhoun, who was then Secretary of War, concurring in the recommendation of James Lovell, the first Surgeon General of the Army, strongly recommended the removal of liquor entirely from the ration.<sup>17</sup>

Nothing was done immediately by Congress upon this recommendation. Indeed, it was not until December 15, 1821, that a measure looking to its adoption was introduced. Upon this date Mr. Walworth, of New York, submitted a resolution to the House that a military committee should inquire into the expediency of discontinuing the liquor



allowances. On a vote the resolution was lost. On January 3, 1822, Representative Walworth again submitted a similar resolution, but Congress adjourned on May 8 without having acted upon it. On June 11, 1829, Mr. Sprague, of Maine, reopened the liquor question, but this again resulted in no definite action. On October 25, 1832, by executive order of the President, 4 pounds of coffee and 8 pounds of sugar per hundred rations were substituted for the allowance of one gill of rum, whiskey or brandy. This is the first appearance of coffee in the ration of the American Army, though by no means the first introduction of coffee to the soldier, for, at posts and whenever groceries could be conveniently purchased, coffee was used. This executive order was enacted into law by Congress in 1838. There was a faint spasm of reaction on the liquor question in 1846 when, as has always been the custom, Congress again discriminated in favor of troops engaged in continuous labor by reenacting the extra allowance of "15c. and one gill of whiskey" for such troops. Rum as a regular component of the ration, however, had been effectively eliminated by the executive order and, as will be noted below, when a plentiful amount of coffee and tea were provided the soldiers willingly relinquished their allowance of liquor.

The report of the first Surgeon General, upon which Calhoun's recommendation for the elimination of liquor was based, is dated November 16, 1818. In many respects this is an epoch-making report and is well worthy of being quoted at some length. It must be remembered in so doing that there was much disease in the war of 1812, and that it was commonly attributed to the ration.

The most prevalent diseases in July, August, and September, 1812, were disorders of the bowels. These disorders may, in some measure, be obviated by obliging the men to cook their food in the form of soup.

The bread was believed to be another source of these complaints. It was bad and unfit for nutriment in several respects. In some instances the flour furnished had commenced a fermentative process which rendered the bread sour; in others, this had progressed so far to a state of putrefaction that its nutritive property was destroyed.

An improvement in the dietetic management would be made should each corps and regiment detail a police officer to inspect daily the kitchens and inforce upon the men the importance of preparing their rations in a manner most conducive to their health.<sup>18</sup>

In 1817 Doctor Lovell, as Chief Medical Officer of the Northern Department, had made a report on the causes of disease in the army as follows:<sup>19</sup>

It required but little ingenuity to surmise that bad food and worse water would produce more or less disturbance in man's stomach or

<sup>18</sup> James Mann: "Medical Sketches of the Campaigns of 1812, 1813, 1814."

<sup>19</sup> H. E. Brown, Medical Department, U. S. Army, 1775-1883, p. 102.

bowels, especially when he had been used to much better fare. The fact is that neither of those accusations was in general just. The provisions were not commonly bad, nor did experiment show any ingredient in the water, at all adequate to the effect supposed. Nor is it believed that there is cause of complaint against the provisions furnished at present.

Bad food or coarse food badly cooked does produce disease . . . but it is meant to say . . . that the food of the soldier was not during the war and certainly is not now of a quality calculated to produce them . . . We are to look to some other cause for the products of these military plagues. And this it is apprehended will be found to arise from an undue exposure to cold and moisture.

On May 14, 1818, Congress had passed a bill creating the office of Surgeon General of the Army and had designated Hospital Surgeon Joseph Lovell to act as Surgeon General to date from April 15, 1818. Thereafter all medical reports and returns were addressed to the Surgeon General.

Surgeon General Lovell had been specially requested by the Secretary of War to investigate the causes of complaints about the ration which were freely voiced by soldiers returned from the war of 1812. In reading this report it must be remembered also that, as the Surgeon General expresses it, "the soldier was his own cook"; in fact, the Army did not have regularly appointed company cooks until the Civil War. The report follows:

It is a well-known fact that every animal, in order to enjoy health, strength and vigor, must be supplied with food adapted to its habits, whether natural or acquired. Hence it follows that a ration perfectly adapted to the wants of a Cossack might be totally useless and perhaps injurious to an American.

Greenlanders (meat eaters) are all from their *general habits* hardy, but they are *ceteris paribus* inferior to the Hindoo, . . . much less have they the stamina of those whom our second nature, habit, has accustomed to a judicious mixture of both these kinds of food. Custom, it is true, has rendered a certain portion of animal food necessary to produce the highest state of health and vigor, but it is believed the quantity required for the purpose has been exceedingly overrated.

Physiologists when discoursing have shown that the former requires from the latter, what they have termed the *stimulus of distension*, as well as a due degree of excitement from nutritious matter, to produce healthy action. That a certain bulk is as necessary as a certain quantity of nutriment, and that so far as one of these is increased at the expense of the other, so far the diet varies from the healthy standard. Thus it appears that a vegetable diet is natural to man. . . . When we take into account the quantity of farinacea employed in bread, pudding, etc., the great variety and abundance of fruits and of the lighter vegetables in addition to the more nutritious ones, as peas, beans, rice, potatoes and many roots, it is probable that four-fifths of our diet is vegetable and perhaps two-thirds in every case. . . .

The very general use of tea or some other warm infusion at the morning and evening meals is a point of no small importance, and nothing but experience can fully convince one how severely the want of it is felt, and of course how necessary that, or a substitute, is for the health of a soldier. . . .

For since the business of cooking belongs in civil life almost entirely to females; when a man is confined to bread and meat he is not only suddenly deprived of his accustomed means, but is entirely ignorant of the best mode of employing those afforded him, and one of the last things a young officer or soldier learns is how to manage his domestic concerns; though he soon becomes acquainted with the necessity of this knowledge both for his health and comfort. When a recruit receives his ration, if the meat be fresh, he broils it to a cinder on the coals on the end of his ramrod; if salt pork, he eats it raw, and if salt beef, he boils it, and with his bread will make a pretty good meal for some time; but in the morning and evening he feels the want of his usual infusion of tea, and at noon of his customary supply of vegetables. As a substitute for the former, he warms the stomach with a gill of undiluted corroding whiskey, and after living a few weeks in this way, is sent to the surgeon, worn down with dysentery, diarrhea and other complaints of the stomach and bowels; if the surgeon be sufficiently acquainted with his duty to give him a light diet of soup, fresh vegetables and hospital stores, instead of loading him with medicine, he is shortly restored to health, and from the same cause as before is shortly returned to the hospital and after being for some months a burden to himself and the community, he is either buried or discharged from the service and perhaps pensioned. This is a process which every one on duty during the late war (1812) has repeatedly witnessed, which occurred with the majority of those enlisted and which rendered the muster rolls of the army a mere list of invalids.

Whenever the mortality was great, during the late war, it was attributed to the quality of the ration, but the fact is, it was on an average as good at these places as usual, and that this was the case is proved from the circumstance that the regiments at these stations, commanded by experienced officers, as well as those in the vicinity, were often in a great measure exempted from disease.

There were two corps, one noted for their good police and the other for their depredations on the fields and gardens of the citizens, who were a continued proof of the true cause of the difference in the health of the men; for experiment soon taught both officer and men the importance of preparing their food in the form of *soups*, and whenever this was done, either in consequence of police regulations or from the soldiers obtaining a supply of the necessary ingredients, the good effects were constantly observed.

An "old soldier" of our country in his "advice to young generals" has very pertinently commenced with "the belly," as he considers a man's stomach to have an essential effect both upon his ability and his inclination to fight. Among the ancients the ration of the soldier was principally if not entirely vegetables, and it is well known what immense burdens they carried, what fatigues they underwent, and what surprising

marches they often performed. . . . Sutling is of nearly as much importance to health, comfort and convenience of the army as the nature of the component parts of the ration—to officers more so; for in both times of peace and in active service they are generally stationed so far from cities and villages as to render them altogether dependent upon the occasional supplies of the irregular followers of a camp. From the experience of the late war there can be no doubt but this circumstance alone rendered service on the frontier more unpleasant and unpopular and caused more desertion, if it may be so termed, than all others together.

In actual service, perhaps, the troops cannot always be regularly paid; some mode should therefore be adopted to secure the sutler his first and authorized demands in all cases. If this were done he could furnish a mess of ten men with all the groceries, etc., they require for \$10 per month.

From the want of proper and regular supplies, for example, the important subject of messing has been almost entirely neglected. An officer, instead of finding his regimental mess a comfortable home, in which he feels an interest and to which he is pleased to return, submits with reluctance to a few months' privation and hardship. . . . After what has been observed upon the nature of the ration, the necessity of a regimental grocery for the health as well as comfort of both officers and men will not probably require further proof.

Most of the diseases of the troops during the late war were by general consent attributed to the ration; but though by no means true to the extent believed, it was too often so, and nine times in ten, damaged flour was the noxious article. . . . Where it can be obtained, kiln-dried cornmeal is far preferable to flour in every respect; but where it cannot, the evil may in a great measure be remedied by causing the latter to be baked in the form of hard biscuits. . . .

For the same reason that kiln-dried cornmeal should, in many cases, be substituted for flour, bacon ought to be furnished instead of salt beef or pork. With this alteration and a *proper reduction of the quantity of the meat*, this part of the ration, provided a due proportion of it be fresh, would be as good as can possibly be required. As to the additional vegetables that may be substituted for part of the meat, the kinds best adapted to this purpose on every account are those used by the British and French, viz., peas, beans, and rice. . . . if issued, either regularly or occasionally, they would not only promote the health and comfort of the soldier, by approaching nearer to his accustomed food, but by enabling him to introduce frequent changes in his mode of preparing it.

If I am rightly informed, by supplying molasses and the essence of spruce, 1 quart of beer may be furnished for about the same as 1 gill of whiskey.

At the request of the surgeon attending a post, where the men were severely attacked with dysentery this last summer, the commanding officer stopped the whiskey and an immediate check was given to the disease.

Vinegar is of great use on many accounts; it is one of the best contractors of the superabundance of bile induced by an unnatural or long-continued stimulus, whether it be the excessive heat of a warm climate,

an abundance of animal food, or that of a crude consistence, or a too free use of ardent spirits; in the latter case, as well as where laudanum or other narcotics have been taken, it seems to act as a specific.

Whenever, therefore, the soldiers are supplied with the lighter vegetables as cabbage, beets, cucumbers, etc., which may, by suitable arrangements, easily be done, especially on the peace establishment, there can be no doubt of the benefit of allowing a sufficient quantity of vinegar to furnish them with a regular supply of pickles.<sup>20</sup>

The salient points of this report are:

1. Reduction of the quantity of meat and providing as much of it as possible as fresh meat.
2. The importance of hot drinks, such as tea.
3. The elimination of ardent spirits and the substitution of spruce beer.
4. Increase of fresh vegetables.
5. Substitution of kiln-dried corn meal for flour.
6. Substitution of bacon for salt beef and pork.
7. Substitution of beans, peas and rice for a part of the beef.
8. The importance of vinegar and pickles.
9. Greater variety.

Although the reasons advanced for some of these changes could scarcely be called sound physiology today, nevertheless the science of nutrition would endorse all of them.

Calhoun<sup>21</sup> in his fervid style sums up the defects of the existing ration system and points out the remedies suggested by the Surgeon General in these words:

There is something shocking to the feelings, that in a country of plenty beyond all others, in a country which ordinarily is so careful of the life and happiness of the meanest of its citizens, that its brave defenders, who are not only ready but anxious to expose their lives for the safety and glory of this country, should, through a defective system of supply, be permitted to starve or to perish by the poison of unwholesome food, as has frequently been the case. We ought also to remember that nothing adds more to the expense of military operations or exposes more to its disasters than the sickness and mortality which result from defective or unwholesome food. Impressed with this view of the subject, considerable changes have been made in the army ration. *The vegetable part of the ration has been much increased.* Twice a week a half allowance of meat with a suitable quantity of peas or beans is directed to be issued. Fresh meat has also been substituted twice a week for salted. In the Southern Division, bacon and kiln-dried Indian cornmeal have been to a certain extent substituted for pork and wheat flour. In addition, orders have been given at all of the permanent posts

<sup>20</sup> John C. Calhoun, Report S. G. O., November 16, 1818.

<sup>21</sup> Report of the Secretary of War, December 15, 1818.

where it can be done to cultivate a sufficient supply of ordinary garden vegetables for the use of the troops.

In addition to these changes, I am of the opinion that the spirit part of the ration, as a regular issue, ought to be dispensed with. And such appears to be the opinion of most of the officers of the Army. It both produces and perpetuates habits of intemperance destructive to the health and the moral and physical energy of the soldiers.

As the result of these changes, made, however, only in orders and not by legislative enactment, the energy value of the ration was greatly increased. (See Table 16 for year 1818.)

Owing to the inaction of Congress, the Surgeon General again advised against the rum component in his report of November 1, 1819, stating that "beer, tea, sugar and coffee might be substituted." He notes that whiskey costs about one-eighth the value of the entire ration, which, at 16c for the ration, at that time would amount to \$60 a month for a company of 100 men, and that if this were spent for vegetables, "the soldier would not only cheerfully acquiesce in the arrangement, but it would tend to render the supplies much better adapted to his situation and his wants."<sup>22</sup>

No doubt these recommendations were aimed at the control of scurvy, which continued to be reported from the posts.

In his report for July 31, 1820, General Lovell<sup>23</sup> again notes that:

Every year experience proves that soldiers cannot live, much less be healthy and useful, when fed upon salted meat and bread alone, especially if those be unsound, which they generally are, when transported to new and distant posts. At such places it appears necessary to supply the men with the *usual articles obtained from the grocers*, as tea, coffee, sugar, etc., etc., and that the most practicable method would probably be through sutlers under proper regulations . . . should means be devised to furnish vegetables at posts where they are not raised; potatoes, onions and cabbages would be preferable and are, in general, most easily obtained and transported. Turnips, carrots, etc., are preserved with more difficulty and are of much less importance in preventing scurvy.

And in his next report,<sup>24</sup> improvement was noted:

The troops at Fernandina have become vastly more healthy than heretofore, which the weightman considers to have *arisen from the establishment of regular messes*, the attention given to cooking and supplying the men with tea, coffee, sugar, etc., in place of the ration of whiskey which they voluntarily relinquished.

The other important event of the year 1818 was the reestablishment of the commissary department. It will be remembered that the office of

<sup>22</sup> Surgeon General's Report, July 31, 1820, page 14.

<sup>23</sup> Surgeon General's Report, August 1, 1821, page 3.

<sup>24</sup> Surgeon General's Report, August 1, 1821, page 3.

commissary general was discontinued in 1781 and that the Army had, since that time, been supplied by contractors dealing directly with the Treasury Department. Throughout the war of 1812 there had been much agitation on account of the failure of the contractors to supply provisions properly. Thus:

The subcontractor at Wilmington has not furnished a day's rations for two weeks. The subcontractors at Billingsport, N. J., and at Marcus Hook have, in defiance of my frequent orders and threats, and contrary to their contract, contrived to palm upon the troops the coarsest and cheapest provisions, and often such as are damaged. To effect this criminal species of speculation, they keep in store little more than, and often not as much as is necessary to meet the returns from day to day. Hence, the troops are often compelled to draw damaged provisions or draw none at all.<sup>25</sup>

Contracts are never fulfilled to the letter and never will be so long as avarice exists, and where so many opportunities present themselves to the military contractors for imposition and fraud, we must expect he will avail himself of them. That his fortune may be made with too great rapidity for the comfort and health of the soldier, every expedient is resorted to to increase his profits. Half-baked bread, sour flour, decayed meat, are amongst the many resources they employ. These evils I have witnessed in every part of the country.<sup>26</sup>

In 1814, after a complete break-down of the contract system, the House asked Monroe, then Secretary of War, for suggestions concerning a revision of the method of provisioning the Army. A new system was worked out, but peace having been signed with the English, Congress adjourned November 4, 1815, and let the bill die.

In 1817 the Seminole Indian outbreak in Georgia gave still another opportunity to show the weakness of the contract system. Under pressure, Gen. Andrew Jackson organized a commissary department of his own, which gave him an opportunity to do greatly increased work. Congress, after getting the necessary evidence, changed the entire method of subsisting the Army in a bill which was approved on April 11, 1818. The Subsistence Division of the Purchase, Storage and Traffic Department today is built upon that foundation, although many modifications and changes necessary with human advancement have been made.

#### THE MEXICAN WAR

The ration which prevailed during the war with Mexico was the one enacted, with the omission of the rum component, on July 5, 1838. The substitution of coffee and sugar, which had been effected by executive order in 1832, was modified by increasing the amount of coffee to

<sup>25</sup> Report to James Monroe, the Secretary of War, by Gen. E. P. Gaines.

<sup>26</sup> Report of Col. J. B. Fenwick, under date of December 23, 1814.

6 pounds and of sugar to 12 pounds per hundred men. The energy value of the ration as prescribed was lower than that of any previous war-time ration, but on account of the substitution, initiated by General Lovell in 1818 and made effective by orders, the ration worked much better than it had in the War of 1812. There was relatively little scurvy, due in part to the fact that the armies lived largely upon the country through which they were operating. Thus it is said of Colonel Doniphan's small force, which defeated a vastly superior force of Mexicans at Brazilito during the campaign resulting in the capture of El Paso and Chihuahua, that:

The provisions upon which the soldiers now began to recruit after their privations included every variety of fruit, wine, and sweetmeats. All of which were, by order of Colonel Doniphan, scrupulously paid for.<sup>27</sup>

On the third of July, 1847, a body of 400 marines landed at Camp Vergara, on the beach near Vera Cruz, and were attached to a brigade which was being formed by Franklin Pierce, later President of the United States, for service with General Scott's army. The medical officer<sup>28</sup> of this battalion of marines gives some intimate details of the dietary experiences of the brigade on its march toward Mexico City.

On the following day, we were regaled with fresh beef shot by our marksmen and skinned, cooked and eaten while the flesh was almost quivering. . . . The cattle, though running wild, were said to belong to Santa Ana. . . .

When we reached the picturesque city of Jalapa it seemed as if we had found another paradise . . . The people came into camp to trade with us, bringing the fruits and vegetables of the torrid and temperate zones, to say nothing of hog skins full of pulque (the famous and favorite national beverage). They brought apples, pears, peaches, bananas, plantains, zapotas, the aguacate or alligator pear, cactus berries and many other fruits which may be gathered by one person in one vicinity. . . . The Jalapenas were probably not adverse to us. At all events they sold us supplies and were honestly paid for them.

While, for the reasons given, scurvy was not widely prevalent, as it had been in the war of 1812, there were doubtless many faults with the diet, some of which must have contributed to the illness which prevailed in poorly sanitated camps. Thus in the opinion of one medical officer: "Intemperance, unwholesome food and irregularity of diet were other prolific sources of ill health."<sup>29</sup>

Even the sick fared remarkably well, however, considering the handicaps of climate. Thus:

<sup>27</sup> Ladd, "War with Mexico," p. 144.

<sup>28</sup> R. McSherry, "A Mexican Campaign Sketch," in his "Essays and Lectures," Bolts, 1869, p. 61.

<sup>29</sup> W. G. Proctor, "On the Disease of the U. S. Army on the Rio Grande," *Western J. of Med. and S.* 75: 1, p. 161.



As soon as the first inflammatory symptoms subsided and there was the least appetite, the patients were put upon a nourishing diet, such as chicken and broth, beef tea and broth, beef soup, fresh meat, coffee, etc., and in certain cases an allowance of wine and even brandy.<sup>30</sup>

Various recommendations were made in 1856 and 1859 to increase the coffee and sugar allowance in the army ration. These recommendations were made by several commanding officers, by the Surgeon General and by the Secretary of War. Finally, on June 21, 1860, soon after Lincoln had been nominated for the presidency, by legislative enactment the coffee was increased to 10 pounds and the sugar to 15 pounds per hundred rations.

#### THE CIVIL WAR

When Fort Sumter was fired upon, April 12, 1861, Lincoln immediately called for 75,000 volunteers and summoned Congress to meet on July 4. On July 29 the following changes were made by an act of Congress:

The army ration shall be increased as follows, viz., 22 ounces of bread or flour or 1 pound of hard bread, instead of the present issue. Fresh beef shall be issued as often as the commanding officer requires it, when practicable, in place of salt meat. Beans, rice and hominy shall be issued as now provided by the regulation. One pound of potatoes per man shall be issued at least three times a week, if practicable. When these articles cannot be issued in these proportions, an equivalent in value shall be issued in some other proper food. A ration of tea may be substituted for the ration of coffee.

Provided, that after the present insurrection shall cease, the ration shall be as provided by law and regulation on the 1st day of July, 1861.

This ration, which prevailed with a single modification until July 8, 1864, was the most liberal one in point of variety and all-round nourishment qualities which had ever been enacted. Potatoes made their first appearance in the prescribed ration, and the all-important principle of commutation, begun in 1790, repealed in 1796, but perpetuated by orders after 1818, now became firmly established by legislative enactment, and has never been again repealed. We shall see that even so wise a provision as this may be subject to abuses when the value of the ration had grown by numerous additions to an amount beyond all reasonable requirement.

Even so good a ration, however, did not guarantee perfect nutritional health of the soldiers. Scurvy made its appearance repeatedly. The cooking, left entirely until March, 1863, to the men themselves, was necessarily very poorly done, and until that date also there was no

<sup>30</sup> Porter, John B., Surgeon of Third Infantry: "Medical and Surgical Notes of Campaigns in the War with Mexico." *American Journal of Medical Science*, 1853, xxy, p. 25.

regular supervision of the sanitation of cooking and messing by the medical officers.

Surgeon Trippler, Medical Director of the Army of the Potomac from July, 1861, to July, 1862, reports:

To bad cooking, bad police, bad ventilation of tents, inattention to personal cleanliness, and unnecessarily irregular habits, we are to attribute the greater proportion of the disease that actually occurred in the army.<sup>31</sup>

And later in the same report:

While still at White House (Virginia on the Pamunkey River) I received a telegram from the front that scurvy had appeared in two brigades of the Army, one of which were the regular troops. I could scarcely credit the accuracy of the information. I knew that the brigade had obeyed the orders issued in relation to the use of vegetables and the manner of cooking their rations. Still I did not think it prudent to disregard the report, and accordingly I telegraphed to Washington for lemons and potash . . . I investigated the report with regard to scurvy and found it to be erroneous. I, however, requested the Adjutant General to compel the men to use desiccated vegetables and to make and use soup daily, unless they were rendered impossible by reason of being actually on the march; the use of fried fresh meat to be absolutely forbidden, boiled or roasted beef to be substituted.<sup>32</sup>

June 14, scurvy was again reported as having appeared in Sumner's corps. I sent an able medical officer to investigate it, who found six cases in the 19th and 20th Mass. regiments, and several others acquiring the predisposition to the disease.<sup>33</sup>

Whilst at Fair Oaks the command, enveloped in malaria, illy supplied with anti-scorbutics, much exposed to the weather and almost nightly harassed by the enemy, suffered much from intermittent fevers, diarrhea and scurvy. A surgeon of brigade reported to me that he had cured some of his cases of diarrhea with raw Irish potatoes in vinegar.<sup>34</sup>

The police was good and the shelter tents were well trenched and the ventilation kept unimpeded, and the tents were directed to be struck every third day, their floors dried and, if practicable, the site changed a little. Notwithstanding, scorbutus made its appearance in the 19th Mass. Volunteers, in General Sedgwick's division of the Second Corps, and the command was very generally, indeed, almost universally affected by symptoms allied to that disease. . . . The medical director of General Richardson's division reports to me verbally that there are similar cases in General Caldwell's brigade. General Dana says he cannot comprehend why the men should have scurvy with their present rations; but I am informed that the desiccated vegetables are so disagreeable to the taste that the men cannot eat them . . . anti-

<sup>31</sup> Medical and Surgical History of the War of the Rebellion, Appended Documents, p. 44.

<sup>32</sup> *Ibid.*, p. 55.

<sup>33</sup> Medical and Surgical History of the War of the Rebellion, Appended Documents, p. 56.

<sup>34</sup> Surgeon J. F. Hammond, Medical Director of Second Army Corps, Medical and Surgical History, Appended Documents, p. 64.

scorbutics ordered. . . . The commissary was also immediately ordered from the headquarters of the army to furnish supplies of potatoes.<sup>35</sup>

Surgeon Trippler was relieved as Medical Director of the Army of the Potomac on July 4, and Surgeon John Letterman was appointed in his place. Letterman writes:<sup>36</sup>

Scurvy made its appearance before the arrival of the Army at Harrison's Landing. The seeds of this disease had doubtless been planted some months previous and were not due merely to want of vegetables, but also to exposure to cold and wet, working and sleeping in the mud and rain and also to the inexperience of the troops in taking proper care of themselves under difficult circumstances. This disease is not to be dreaded merely because of the numbers it sends upon the reports of the sick; its influence and the cause which give rise to it undermine the strength, depress the spirits, take away the energy, courage and elasticity of those who do not report themselves sick and yet are not well. They do not feel sick, and yet their energy, their powers of endurance and their willingness to undergo hardships are in a great degree gone and they know not why. In this way, it had an effect upon the fighting power of the Army much more than was indicated by the numbers it had sent upon the reports of sick.

Letterman was one of the great sanitarians of the Civil War. It might also be said that he laid the foundations of the sanitary regulations of the army today. While the shipment of wounded and sick from Harrison's Landing was going on, he gave immediate attention to "ascertaining the most expeditious method of improving the health of the Army." The results of the investigation made and the means of carrying into effect the medical measures recommended were set forth in a communication transmitted by him to the Assistant Adjutant General on July 18.

An extract from this communication was published to the Army in orders, and from this extract may be quoted enough to indicate the views which Letterman entertained on the relation of food to the health of an army and which he submitted to the commanding general.

The diseases prevailing in our army are generally of a mild type and are not increasing. Their chief causes in my opinion are a want of proper food and that improperly prepared, exposure to the malaria of swamps and the inclemencies of weather, excessive fatigue and want of natural rest, combined with great excitement of several days' duration and the exhaustion consequent thereon. I would recommend to remedy these evils:

1. That food, with an abundance of fresh vegetables, shelter, rest with a moderate amount of exercise, be given all the troops and general and personal police be enforced.
2. To accomplish this I would suggest that an abundant supply of

<sup>35</sup> *Ibid.*, p. 66.

<sup>36</sup> Report to Surgeon General, *ibid.*, p. 92.

fresh onions and potatoes be issued daily for a fortnight and thereafter twice a week, *cost what they may*.

3. That desiccated vegetables, dried apples or peaches and pickles be used three times a week.

4. That a supply of fresh bread by floating (mobile) ovens or other methods be distributed at least three times a week.

5. That the food be prepared by companies and not by squads.

6. That there be two men detailed from each company as permanent cooks to be governed in making the soups and cooking by the enclosed directions.

7. That wells be dug as deep as the water will permit.

8. That the troops be provided with tent or other shelter to protect them from the sun or rain, which shall be raised daily and struck twice a week upon new ground.

9. That when troops march they shall have breakfast, if only a cup of coffee before starting, and after their arrival in camp each man be given a gill of whiskey in canteen three-quarters filled with water.<sup>37</sup>

Before the communication to the Adjutant General was written the existence of scurvy attracted my serious consideration, and upon consultation with Col. F. H. Clark, Chief Commissary of the Army, large supplies of potatoes, onions, cabbage, tomatoes, squash, peas, and fresh bread were ordered by him. The first arrival of antiscorbutics was on the seventh day of July. Potatoes and onions arrived on July 20, and thereafter the supplies were so abundant that potatoes, onions and cabbages rotted at the wharves for want of someone to take them away. The fresh bread was eagerly sought for by the men, as they loathed the hard bread which they had used for so many weeks. This loathing was no affectation, for this bread is difficult to masticate, is dry and insipid, and absorbs all the secretions poured into the mouth and stomach and leaves none for the digestion of other portions of food. The craving for fresh bread was founded in reason and was not a mere whim. In addition to these vegetables and fresh bread procured by the Commissary Department, 1,500 boxes of fresh lemons were issued by the medical purveyor to the various hospitals and to the troops. The beneficial effects of this treatment soon became perceptible on the health of the men and, when we left Harrison's Landing, scurvy had disappeared from the Army of the Potomac.

As a result of Letterman's progressive measures the health of the Army greatly improved, and Congress was so much impressed that on March 30, 1863, it gave the Medical Department more authority than this department had hitherto enjoyed in relation to the subsistence of troops. The act provides that:

1. Officers of the Medical Department shall unite with the line officers of the Army, under such rules and regulations as shall be prescribed by the Secretary of War, to supervise the cooking as an important sanitary measure, and said Medical Department shall promulgate to its officers such regulations and instructions as may tend to insure the proper preparation of the ration of the soldier.

<sup>37</sup> *Ibid.*, p. 9A

2. Cooks shall be detailed in turn from the privates of each company of troops at the rate of one cook for each company of over 30 men, the cooks to serve ten days each.

3. The President of the United States is authorized to cause to be enlisted for each cook two under cooks of African descent, who shall receive \$10.00 per month and one ration per day.

4. The army ration shall hereafter include pepper in the proportion of 4 ounces to 100 rations.

Why Congress did not at this time adopt Letterman's suggestion that *permanent* cooks should be detailed is a mystery, unless it be the fear of the appearance of discrimination.

A word or two may be said at this place on the subject of desiccated vegetables. It is evident from the quotations cited that it was the belief of certain medical officers at least that scurvy could be effectively prevented by the use of desiccated potatoes, onions and the like. This is now known to be erroneous, for the anti-scorbutic vitamine in these vegetables is to a large extent destroyed<sup>38</sup> by drying, although it is not destroyed in tomatoes<sup>39</sup> or in citrus fruit<sup>40</sup> by drying them under the same conditions. Hence the wisdom of Letterman's recommendation that fresh onions and potatoes be issued regularly, "*cost what they may.*" The statement that one surgeon had, in his belief, cured cases of diarrhea with raw Irish potatoes in vinegar is interesting in relation to the fact that scurvy is often accompanied by diarrhea, and the observation that the anti-scorbutic vitamine seems to be preserved in an acid medium.<sup>41</sup>

Scurvy was not wholly eliminated from the Army of the Potomac even as late as the winter of 1863, as the following report of Medical Director McParlin proves, but the importance of *fresh* vegetables for its control seems, from the same report, to have been appreciated:

The importance of a proper diet during the winter preceding the campaign, to enable the troops to resist the depressing influence of ordinary fatigues, privations and exposure and to preserve them vigorous to the latest period before active operations commenced, had not been overlooked, and reports of the issue of vegetables, soft bread and other valuable articles of the ration had been required. The appearance of scorbutic taint in the cavalry, and the detection of discrepancies in reports in that and the second corps in regard to issues, called for investigation. . . .

During the months of January, February, March and April, 1864 . . . the rations furnished were abundant in quantity and of good quality and variety, the average weekly issue including three days'

<sup>38</sup> Holst and Frolich, *Z. Hyg.*, 1921, lxxii, 1; 1913, lxxv, 334. Chick and Hume, *Tr. Soc. Trop. Med. and Hyg.*, 1916-17, x, 141. Hess and Unger, *Journ. Biol. Chem.*, 1919, xxxv, 429-437.

<sup>39</sup> Givens and McClugage, *Journ. Biol. Chem.*, 1919, xxxvii, 253.

<sup>40</sup> Givens and McClugage, *Amer. Journ. Dis. of Chil.*, 1919, xviii, p. 30.

<sup>41</sup> Hess and Unger, *Proc. Soc. Exp. Biol. and Med.*, 1919, xvi, 52.

rations of fresh beef, three and a half of bread, four and a half of potatoes and two and a third of other vegetables.<sup>42</sup>

McParlin had been Medical Director of the Army of Virginia under Pope in his ill-fated campaign ending in second Bull Run, and, as such, took vigorous measures for supplying food to the sick and wounded.

. . . In this connection I will say that it is often difficult to obtain rations, to find a commissary, or induce an issue, except to those of the special command they move with. To obviate this, I obtained and carried with me a copy of the following order:

"HEADQUARTERS, ARMY OF VIRGINIA,  
August 29, 1862.

"To the various commissaries of volunteers of the Army of Virginia. You will each of you issue rations to hospitals in the field on the surgeon's requisitions or returns, no matter to what corps, brigade or command the commissaries or surgeons belong.

"By order of Major General Pope:

"E. G. BECKWITH,  
"Col., C. C. S."<sup>43</sup>

The military exigencies and, no doubt, the inexperience of medical and other officers had in the early days of the war exposed the sick and wounded all too frequently to the risk of undernourishment. Thus:

The field hospital at (first) Bull Run was established about one-quarter of a mile from the front line when we engaged, but late in the day it was three-quarters of a mile in the rear . . . The hospital was located 100 yards from Sedley's Ford, where an abundance of muddy water could be obtained, but no food of any description. The weather was fine on July 21.<sup>44</sup>

There was no lack of surgical appliances and medicine (at Fair Oaks), but owing to the rise of the Chickahominy after our corps crossed, there was a great scarcity of provisions, and the wounded were in danger of dying for the want of sustenance. At the suggestion of Medical Director Hammond I had two cavalry horses killed and made into soup for them. This, in addition to small quantities of rice and salt that I was able to get from *ambulance* and ammunition wagons, made a *very nutritious diet*.<sup>45</sup>

Speaking of the battle of Williamsburg on Tuesday afternoon, I dressed the wounds of both Union and Confederate soldiers at the barracks near Ft. McGruder, and on Wednesday, May 8, I dressed wounds of both armies in a church at William and Mary College in Williamsburg. . . . The supply of soup and food was very deficient during the first twenty-four hours, because the roads were in such condition that the supply trains could not move up. Pack mules would

<sup>42</sup> Report of Surgeon Thos. A. McParlin, Medical Director Army of the Potomac, January 14 to July 31, 1861, Appended Documents, p. 112.

<sup>43</sup> *Ibid.*, p. 114.

<sup>44</sup> John W. Foye, U. S. A., Assistant Surgeon of 11th Infantry. *Ibid.*, p. 83.

<sup>45</sup> Dr. W. Hand, U. S. A., Brigade Surgeon in Second Corps.

have been of very great service here. Indeed, we sent footmen back to meet the trains and bring up hard biscuit, sugar and coffee.<sup>46</sup>

Even as late as Gettysburg there was some suffering and a great deal of discomfort from lack of food for the sick and wounded, but relief came more promptly both from military and civilian agencies, the Sanitary Commission in particular.

The chief lack was as usual in tents, bedding, clothing and food. Of these, the lack of food was naturally the most pressing. During the battle there was little to be had. On July 4, Chief Commissary Clark distributed 30,000 rations to the hospital, then containing approximately 16,000 wounded. From that time on there was an ample supply of ordinary rations, but there was still a want of hospital delicacies. After the retreat of the Confederate Army and when the want of supplies became known, food and supplies of all kinds came pouring in from the northern cities and towns in enormous quantities. The supplies furnished by the Sanitary and Christian Commissions will be mentioned later. It was only during the first week that there was suffering on account of the lack of supplies. One of the Sanitary Commission agents said: "After this battle relief came promptly; it was on our own soil, and the great heart of the people was stirred to its depths. All the home luxuries that could be were lavished with unsparing hand. The Government, fully equipped for the contest, had medical and hospital stores abundantly supplied. With its perfectly organized system and immense resources the U. S. Sanitary Commission was ready to fill demands which the Government could not. There was no longer continued suffering as in the earlier battles." If in the beginning the wounded suffered for lack of food and supplies, in the end they were in danger of too much.<sup>47</sup>

Speaking of the work of the Sanitary Commission, Duncan says:<sup>48</sup>

It may be stated here that the Sanitary Commission Agent did not go through the hospitals with baskets scattering food and supplies right and left after the fashion of citizens generally, but issued their stores to the medical officers or gave them out by their authority. After the battle ten wagonloads of their supplies reached the field before any of the regular supplies could be brought up.

In the first railway train which reached Gettysburg were two carloads of supplies for the commission, and two more came each day for a week. A storehouse was opened in a town, and it was soon overflowing with an abundant outpouring of those at home. Each morning wagons of the various division hospitals were before the door, and each day they went away loaded with such articles as were desired. If articles needed were not on hand, they were telegraphed for and arrived by the next train. Tons of ice, mutton, poultry, fish, vegetables, softbreads, eggs, butter and other substantial and delicate foods were provided.

<sup>46</sup> Z. E. Bliss, Assistant Surgeon, 3d Michigan Volunteers. *Ibid.*, p. 86.

<sup>47</sup> L. C. Duncan: "Medical Department of the U. S. Army in the Civil War," p. 18.

<sup>48</sup> *Ibid.*, p. 27.

In regions where the Sanitary Commission could not operate the old difficulties were encountered constantly.

I made very effort to familiarize myself with the topographical resources of the country. As a great struggle was anticipated, food for the wounded and an easy way to the rear were the main points to be kept in view. These were the main difficulties that were met with in the east also. It was never medicine or surgical needs that were too great to be met, but simple things like food, tents, ambulances, and trains. These are the needs that almost every medical director and every medical officer found to fail from Bull Run to Appomatox.<sup>49</sup>

Bragg advanced to a position on Mission Ridge and Lookout Mountain and blockaded the city. Wheeler got in the rear and played havoc with the supply trains running back to Bridgeport. The autumn rains came and the roads became almost impassable. Rations became scarcer and scarcer. Troops were put on half rations, and even these sometimes failed. Surgeon John Moore says that for several days corn in the ear was issued as bread rations.<sup>50</sup>

The Confederates, as is well known, suffered even more for lack of suitable food for the sick, especially in the latter days of the war when provisions had been cut off by the blockade and the domestic supply was exhausted. It is not so well known, however, that their care of the sick in the early days of the war also would seem, from the following quotation, to have been inferior:

Five days after the engagement (Gains Mill) we had but three assistants, scarcely enough to carry water, and in consequence were obliged to use every man who was but slightly wounded . . . as nurses. At the termination of the above-named period, we succeeded in obtaining six prisoners who were paroled not to escape. These men were detailed as nurses, and a more worthless half dozen it would have been difficult to find. The ration furnished for the patients by the Confederate authorities consisted of flour with bacon with a small portion of beans, salted beef and salt. The quantity was exceedingly small, and many of the poor wretches forgot the pain of their injuries in the more terrible pangs of hunger.<sup>51</sup>

*(To be continued)*

<sup>49</sup> Duncan, quoting Surgeon Perrin, Medical Director of the Army of the Cumberland. *Ibid.*, p. 41.

<sup>50</sup> *Ibid.*, p. 33.

<sup>51</sup> Surgeon H. S. Schere, U. S. A., Appended Documents, p. 76.





## NOTES ON AMERICAN MOSQUITOES

(*Diptera, Culicidae*)

BY HARRISON G. DYAR\* AND C. S. LUDLOW†

(With two illustrations)

FURTHER material of interest has been received in the collections made by Army Surgeons, transmitted to the Army Medical Museum, and we here note the descriptions of the males of two species of *Culicidae* which were hitherto unknown in this sex, and a new *Culex* of the subgenus *Chocroporpa*.

### *Goeldia espinii* Martini

*Lesticocampa espinii* Martini, Ins. Ins. Mens., II, 65, 1914.

*Trichoprosopon (Joblotia) shropshirei* Ludlow, Psyche XXVI, 168, 1920.

*Goeldia espinii* Dyar, Ins. Ins. Mens., IX, 27, 1921.

This species has been rather commonly received in hand catches, but all the specimens were females. At present two males are before us, Gatun, C. Z., October 6, 1921, and Ft. Randolph, C. Z., October 1, 1921.

There are in this species pale minute hairs on the anterior margin of the clypeus which render the generic position somewhat uncertain as between *Goeldia* (*Lesticocampa*) and *Joblotia*, and this caused the overlooking of the earlier description of *Lesticocampa espinii* Martini (that genus not being considered at all), and the re-description of the species as *Trichoprosopon (Joblotia) shropshirei*.

Male hypopygium (Fig. A). Side pieces slender and long, a slight lobe on the inner margin, about a third from base, bearing a stout seta, preceded by smaller ones. Clasper long and slender, uniform, the terminal spine very small and included. Tenth sternites simple, long and slender, with curved points. Ninth tergites broad and short with six long spines.

Differentiates itself from the other known species of *Goeldia* by the single-haired lobe of side piece and the singly pointed tenth sternites.

The general coloration of the male closely follows that of the female as given in the description referred to above. The antennal joints are short, somewhat shorter than in the female, with plumose hairs, the last two joints long and slender. Palpi short as in the female. Length: about 3 mm.

One of these male types has been deposited in the Army Medical Museum, and the other added to the females at the U. S. National Museum, completing that series.

\*U. S. National Museum.

†Army Medical Museum.

*Aedes theleter* Dyar

*Aedes* (*Taeniorhynchus*?) *theleter* Dyar, Ins. Ins. Mens., VI, 129, 1916.

A single male received from Camp McAllen, Texas, taken August 28, 1921. This species was known heretofore only in the female.



Male hypopygium of *Goeldia espini* Martini

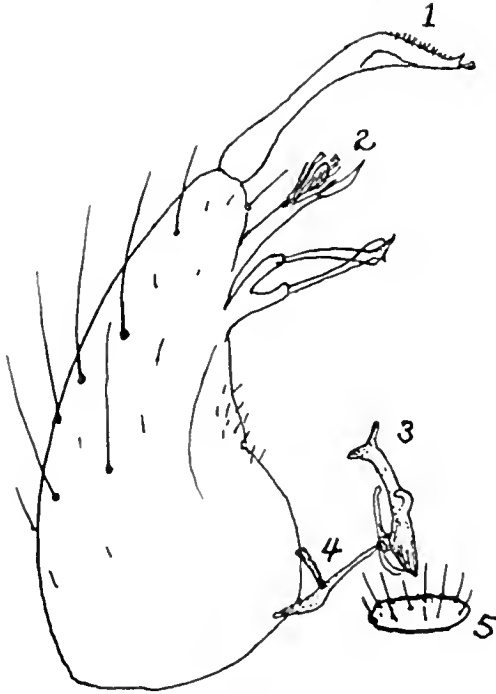
The male shows the characteristic hypopygium of the *scapularis* group, in which there is no differentiation between the species, although the character itself is well marked. In describing the species from females, the author imagined that it might belong to the sub-genus *Taeniorhyn-*

*chus* (*Culiselsa*). But now that the male is known, it is seen to fall with *scapularis* in *Ochlerotatus*.

The male has been added to the female types at the U. S. National Museum.

***Culex* (*Choeroporpa*) *aneles*, new species**

Female. Head covered with brown curved and flat scales, the latter very dark, and brown forked scales having ochraceous reflections,



**B**

Parts of Male hypopygium of *Culex aneles* Dyar and Ludlow

1. Clasper.
2. Outer division of lobe of side-piece.
3. Mesosomal plate.
4. Articulated plate (Basal plate)
5. Ninth tergite.

brown bristles around the eyes and projecting forward between the eyes. Proboscis slender, dark brown. Palpi very short, dark brown. Antennae brown, verticils and pubescence brown. Eyes dark brown. Clypeus brown, nude.

Thorax. Prothoracic lobes lateral, brown, partly denuded, a few thin brown scales, and brown bristles remaining. Mesonotum brown

with small brown curved scales, also partly denuded. The scutellum like mesonotum, and there have been bristles on each lobe. Pleura brown, a few brown bristles remaining. Metanotum brown.

Abdomen brown, brown scaled, with golden brown or light segmental and lateral bristles, more than usually hairy. Venter mostly hidden, terminal segments brown.

Legs: coxae and trochanters light brown, femora dorsally brown, and ventrally light almost to the apex, otherwise the legs are brown. The femora of the fore-legs give the appearance of being swollen toward the apex, but this may be due to distortion, as the specimen is not in good condition.

Claw formula 0.0-0.0-0.0.

Wings are a little fuscous, the scales brown, "Taeniorhynchus" like on the costal portion and the forks of the 2d and 4th long veins; ligulate on the stems of 2d, 4th and 5th long veins; the cells are very long, the first submarginal approximately six times as long as its petiole, and the second posterior about five times as long as its petiole, the bases nearly in a line. The posterior cross vein not so long as the mid, and about five times its own length interior. Halteres with light (tan) stem, and darker knobs.

Length: about 3 mm. without proboscis; wing about 3 mm.

Habitat: Cardenas, C. Z.

Taken: Feb. 11, 1921.

Male hypopygium (Fig. B). In the table of species of this subgenus (Ins. Ins. Mens. VIII, 79-81, 1920), the present form runs as follows: 1 to 2; 2 to 5; 5 to 12; 12 to 15; 15 to 16; 16 to 19; 19 to 20; 20 to 21; 21 to 24; 24 to 25. Here it falls with *carcinophilus*, *bastagarius* and *vapulans*, differing from them all in detail. The leaf is small and obliquely ribbed, arising in the outer group of setae, which are sessile on the shaft. The inner arm is distinct, with a stout appendage and a small one. The third point on the mesosomal plate is at the middle of the shaft, and is as in *educator*; but that species has no leaf on the outer division of lobe of side-piece. The specimen is much injured, but the wing scales are "Taeniorhynchus" like, and the cells are very long, about five times as long as their petioles. General coloration like that of the female.

Described from two specimens, one male and one female. The specimens are in poor condition. Both bred from larvae taken from the Cardenas River.

The female type is deposited at the Army Medical Museum. The male type has been deposited at the U. S. National Museum. Type No. 25069.

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Original articles, items of news and matter of interest to the Services are welcomed. Requests for reprints should be made at the time of forwarding articles.

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## WHO SHALL TEACH, AND WHAT SHALL HE TEACH?

Since Adam and Eve were cast out of the Garden we have divided certain things into two categories. They began it with their girdles of fig leaves, and as we have advanced in civilization we have followed in their footsteps. Clothing, where it was a cosmetic effect rather than a climatic necessity, was limited to a girdle. Our anatomy came to take on the same quality of hesitancy, and certain parts of our bodies we denominated as the "pudenda," the things to be ashamed of.

So, in the same manner as civilization went on, we classed together certain ills and affections of the flesh and denominated them the "venereal diseases," and either spoke of them with bated breath or else spoke not at all, believing perhaps, like the ostrich, that by ignoring them we could demonstrate that they did not exist.

Sex education, the teaching of the young how they are made and why, has for many years been in this taboo class, and it was a brave father or mother who would frankly and honestly instruct the children in the matter of sex development and the mysteries of reproduction. This over-delicacy, this aversion to facts, alike in its nature to the spirit which decided that one part of our body was something to be ashamed of while another was quite within the pale, has for long been responsible for uneducated adolescents, or, what is worse, for those who learned only distorted facts and much obscenity from equally ignorant informers instead of the wonderful mysteries of procreation.

The solution of the problem is, of course, difficult. So is that of the regulation of prostitution, or the limitation of the spread of the so-called venereal diseases. Nevertheless, that has not deterred many

minds from bending their energies to this task with the hope that from many counsels might spring some satisfactory answer.

Sir G. Archdall Reid, K.B.E., M.B., etc., in the *International Journal of Public Health*, Vol. II, No. 6 (Nov.-Dec., 1921), pp. 592-3, says:

But in Christendom, and especially among English-speaking peoples, a convention forbids the discussion of sex and its problems between children and adults. The former, therefore, learn nothing from the latter except extreme reticence. Nevertheless a knowledge of sex and its functions is traditional among boys, whose discussions are often obscene. As the twig is bent the tree grows. Children, therefore, are the real teachers of sexual morality, such as it is. Many men grow up unmoral rather than immoral. They know of course that unchastity is classed as wicked, but they are no more affected by this opinion than beef-eating Englishmen in India are affected by the opinions of Hindus. Even in old age such people remember past intrigues with satisfaction. The question as to whether adults should hold familiar discourse with children about sex is not within the range of practical politics. The convention of reticence is too strong. Nevertheless it is remarkable that the very people who most desire chastity should most object to the real teaching of it.

It seems to us that the crux of the matter lies in the sentence, "The convention of reticence is too strong." For many past generations we have been taught not to speak of these things. We have allowed our children to acquire such knowledge as they might in a haphazard way, making them, as Sir Archdall says, "the real teachers of sexual morality, such as it is." We have sent our daughters to the marriage bed and motherhood in the innocence and ignorance of babyhood, to puzzle out, too often perhaps with disgusted minds, facts and conditions which might, with proper instruction, have had a dignified meaning and a proper place in the scheme of the creation of things.

Even from the so-called Victorian age, when our young ladies were wont to shriek at mice and faint on the slightest provocation, we have advanced to a much more practical, a much more sound materialism. Clothes are more rational, manners more frank and morals, save for the post-bellum attack of mental measles which has swept over the world, probably no worse. If we are to continue in the spirit of engaging frankness, why should we limit it to those things which have not half the bearing on the welfare of the nation which proper education as to self contains? The old Greek admonition of *Gnothi seauton* is quite as applicable in these times as in the days of Pindar and the Grecian games.

Not everyone is competent to give this instruction. The reasons are not far to seek. Not all are endowed with the requisite tact. Not all are endowed with the requisite knowledge. That which our fathers did not do comes hard to our hands. What they did not instruct us in

we find it hard to pass on to our own younger generation. But there must be a beginning somewhere, and those of us who lack in knowledge, have the possibility of learning. Knowledge along this line lies in the hands of the disciples of Aesculapius, and if we do not teach the youth we may at least instruct the parents, ground them in the simple fundamentals which are, after all, the requisites for the childish comprehension. Complicated courses in physiology are not essential in the instruction of those of younger years. Plain facts, such facts as are essential, thoughtfully stated by one who occupies a position of trust and love, are sufficient for their needs. For this reason it seems preferable that instruction in these matters of sex development be given by the child's parents rather than by one not related. There would naturally be less embarrassment resulting in information imparted in this manner, and it would seem that relations of trust and confidence would be thereby fostered and strengthened. School instruction in such matters, under the inhibition of the "convention of reticence," does not seem to afford the same opportunity for frank, serious and rational discussion and explanation as would the teaching by the parent.

It is scarcely debatable that we have for too long deferred this process of enlightenment, governing ourselves by the old idea that these were things of which we should not speak. Is it not time that the question were faced squarely, that the issue were honestly met? It is admitted that in the campaign against the spread of "venereal diseases" instruction in regard to them plays at least some part. If this be so, why should not reasonable teaching in regard to sex development have a bearing along this line also? Make less of a mystery of the function of the perpetuation of the species and there will probably be fewer conclaves of small boys under the back porch absorbing distorted facts and obscene myths to the injury of their moral sense, and probably later to their physical well being.

The trend of the times is along the line of more frankness in many things, and it seems as though there should be a general move toward enlightenment on this subject, which has such a vital bearing on the right start of the citizens of tomorrow and, through them, on the general welfare of the nation.

JAMES ROBB CHURCH.



## ASSOCIATION NOTES

At a meeting of the Executive Council of The Association of Military Surgeons, December 2, 1921, the following names were proposed and elected to membership in the Association:

### **Medical Corps, U. S. Navy**

#### *Captain*

Charles S. Butler

### **Medical Corps, U. S. Army**

#### *Captains*

James M. Miller

Francis J. Powers

#### *First Lieutenants*

Isadore Katz

Samuel Huston Miller

Alfred Mordecai

### **Medical Reserve Corps, U. S. Army**

#### *Majors*

Ralph Gates Cressman

Richard J. Dowdall

Walter F. Schmaltz

#### *First Lieutenants*

Nesmith Perry Nelson

John Charles Whiteaker

### **United States Public Health Service**

#### *Passed Assistant Surgeons*

Paul Christopher Christian

Robert J. Hamilton

#### *Assistant Surgeons*

Dolor J. LaFond

#### *Acting Assistant Surgeons*

Felix Alfaro Diaz

Triandaphyllos G. Filtzos

Anna S. B. Kearsley

George Morton

Arthur Grant Rodgers, Jr.

John A. Sheldon

Henry C. Story

#### *Attending Specialists*

William House

John Francis McCusker





## COMMENT AND CRITICISM

### GENERAL REGULATIONS FOR THE OFFICERS' RESERVE CORPS AND THOSE PERTAINING TO THE MEDICAL DEPARTMENT RESERVE CORPS AS EXTRACTED FROM S. R. NO. 43 W. D., 4 AUGUST, 1921

#### SECTION I

##### PROVISIONS OF LAW

1. *Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled*, That the Army of the United States shall consist of the Regular Army, the National Guard while in the service of the United States, and the Organized Reserves, including the Officers' Reserve Corps and the Enlisted Reserve Corps. (Sec. 1, National Defense Act, as amended June 4, 1920.)

2. ORGANIZATION OF THE ARMY.—The organized peace establishment, including the Regular Army, the National Guard, and the Organized Reserves, shall include all of those divisions and other military organizations necessary to form the basis for a complete and immediate mobilization for the national defense in the event of a national emergency declared by Congress. The Army shall at all times be organized so far as practicable into brigades, divisions, and army corps, and, whenever the President may deem it expedient, into armies. For purposes of administration, training, and tactical control the continental area of the United States shall be divided on a basis of military population into corps areas. Each corps area shall contain at least one division of the National Guard or Organized Reserves and such other troops as the President may direct. The President is authorized to group any or all corps areas into army areas or departments. (Sec. 3, National Defense Act, as amended June 4, 1920.)

3. THE INITIAL ORGANIZATION OF THE NATIONAL GUARD AND THE ORGANIZED RESERVES.—In the reorganization of the National Guard and in the initial organization of the Organized Reserves, the names, numbers, and other designations, flags, and records of the divisions and subordinate units thereof that served in the World War between April 6, 1917, and November 11, 1918, shall be preserved as such as far as practicable. . . . (Sec. 3a, National Defense Act, as amended June 4, 1920.)

4. GENERAL STAFF CORPS.—The General Staff Corps shall consist of the Chief of Staff, the War Department General Staff, and the General Staff with troops. . . . The initial eligible list shall be prepared by a board consisting of the general of the Army, the commandant of the

General Staff College, the commandant of the General Service Schools, and two other general officers of the line, selected by the Secretary of War, who are not then members of the General Staff Corps. This board shall select and report the names of all officers of the Regular Army, National Guard, and Officers' Reserve Corps of the following classes who are recommended by them as qualified by education, military experience, and character for General Staff duty.

(a) Those officers graduated from the Army Staff College or the Army War College prior to July 1, 1917, who, upon graduation, were specifically recommended for duty as commander or chief of staff of a division or higher tactical unit, or for detail in the General Staff Corps;

(b) Those officers who, since April 6, 1917, have commanded a division or higher tactical unit, or have demonstrated by actual service in the World War that they are qualified for General Staff duty.

After the completion of the initial General Staff Corps eligible list, the name of no officer shall be added thereto unless upon graduation from the General Staff School he is specifically recommended as qualified for General Staff duty. . . .

All policies and regulations affecting the organization, distribution, and training of the National Guard and the Organized Reserves, and all policies and regulations affecting the appointment, assignment, promotion, and discharge of reserve officers, shall be prepared by committees of appropriate branches or divisions of the War Department General Staff, to which shall be added an equal number of reserve officers, including reserve officers who hold or have held commissions in the National Guard, and whose names are borne on lists of officers suitable for such duty, submitted by the governors of the several states and territories. For the purposes specified herein, they shall be regarded as additional members of the General Staff while so serving; . . . (Sec. 5, National Defense Act, as amended June 4, 1920.)

5. ELIGIBILITY FOR APPOINTMENT IN THE REGULAR ARMY.—Except as otherwise herein provided, appointments shall be made in the grade of second lieutenant, first, from graduates of the United States Military Academy; second, from warrant officers and enlisted men of the Regular Army between the ages of 21 and 30 years, who have had at least two years' service; and, third, from reserve officers, and from officers, warrant officers, and enlisted men of the National Guard, members of the Enlisted Reserve Corps, and graduates of technical institutions approved by the Secretary of War, all between the ages of 21 and 30 years. Any vacancy in the grade of captain in the Judge Advocate General's Department, not filled by transfer or detail from another branch, may, in the discretion of the President, be filled by appointment from reserve judge advocates

between the ages of 30 and 36 years, and such appointee shall be placed upon the promotion list immediately below the junior captain on said list. Appointments in the Medical and Dental Corps shall be made in the grade of first lieutenant from reserve medical and dental officers, respectively, between the ages of 23 and 32 years; in the Veterinary Corps in the grade of second lieutenant from reserve veterinary officers between the ages of 21 and 30 years; and in the Medical Administrative Corps in the grade of second lieutenant from enlisted men of the Medical Department between the ages of 21 and 32 years, who have had at least two years' service. To be eligible for appointment in the Dental Corps, a candidate must be a graduate of a recognized dental college, and have been engaged in the practice of this profession for at least two years subsequent to graduation. Appointments as chaplains shall be made from among persons duly accredited by some religious denomination or organization, and of good standing therein, between the ages of 23 and 45 years. . . . (Sec. 24c, National Defense Act, as amended June 4, 1920.)

6. OFFICERS' RESERVE CORPS.—For the purpose of providing a reserve of officers available for military service when needed, there shall be organized an Officers' Reserve Corps consisting of general officers, of sections corresponding to the various branches of the Regular Army, and of such additional sections as the President may direct. The grades in each section and the number in each grade shall be as the President may prescribe. Reserve officers shall be appointed and commissioned by the President alone, except general officers, who shall be appointed by and with the advice and consent of the Senate. Appointment in every case shall be for a period of five years, but an appointment in force at the outbreak of war, or made in time of war, shall continue in force until six months after its termination. Any reserve officer may be discharged at any time in the discretion of the President. A reserve officer appointed during the existence of a state of war shall be entitled to discharge within six months after its termination if he makes application therefor. In time of peace, a reserve officer must, at the time of his appointment, be a citizen of the United States or of the Philippine Islands, between the ages of 21 and 60 years. Any person who has been an officer of the Army at any time between April 6, 1917, and June 30, 1919, or an officer of the Regular Army at any time, may be appointed as a reserve officer in the highest grade which he held in the Army or any lower grade; any person now serving as an officer of the National Guard may be appointed as a reserve officer in his present or any lower grade; no other person shall in time of peace be originally appointed as a reserve officer of Infantry, Cavalry, Field Artillery, Coast Artillery, or Air Service in a grade above

that of second lieutenant. In time of peace appointments in the Infantry, Cavalry, Field Artillery, Coast Artillery, and Air Service shall be limited to former officers of the Army, graduates of the Reserve Officers' Training Corps, as provided in section 47b, hereof, warrant officers and enlisted men of the Regular Army, National Guard, and Enlisted Reserve Corps, and persons who served in the Army at some time between April 6, 1917, and November 11, 1918. Promotions and transfers shall be made under such rules as may be prescribed by the President, and shall be based so far as practicable upon recommendations made in the established chain of command, but no reserve officer shall be promoted to any grade in time of peace until he has held a commission for at least one year in the next lower grade. So far as practicable, reserve officers shall be assigned to units in the locality of their places of residence. Nothing in this act shall operate to deprive a reserve officer of the reserve commission he now holds. Any reserve officer may hold a commission in the National Guard without thereby vacating his reserve commission. (Sec. 37, National Defense Act, as amended June 4, 1920.)

7. RESERVE OFFICERS ON ACTIVE DUTY.—To the extent provided for from time to time by appropriations for this specific purpose, the President may order reserve officers to active duty at any time and for any period; but except in time of a national emergency expressly declared by Congress, no reserve officer shall be employed on active duty for more than 15 days in any calendar year without his own consent. A reserve officer shall not be entitled to pay and allowances except when on active duty. When on active duty he shall receive the same pay and allowances as an officer of the Regular Army of the same grade and length of active service, and mileage from his home to his first station and from his last station to his home, but shall not be entitled to retirement or retired pay. (Sec. 37a, National Defense Act, as amended June 4, 1920.)

8. APPOINTMENT OF GRADUATES OF RESERVE OFFICERS' TRAINING CORPS AS RESERVE OFFICERS.—The President alone, under such regulations as he may prescribe, is hereby authorized to appoint as a reserve officer of the Army of the United States any graduate of the senior division of the Reserve Officers' Training Corps who shall have satisfactorily completed the further training provided for in section 47a of this act, or any graduate of the junior division who shall have satisfactorily completed the courses of military training prescribed for the senior division and the further training provided for in section 47a of this act, and shall have participated in such practical instruction subsequent to graduation as the Secretary of War shall prescribe, who shall have arrived at the age of 21 years and who shall agree, under oath in writing, to serve the United States in the capacity of a reserve officer of the Army of the United

States during a period of at least five years from the date of his appointment as such reserve officer, unless sooner discharged by proper authority: *Provided*, That no reserve officer appointed pursuant to this act shall be entitled to retirement, or to retired pay, and shall be eligible for pension only for disability incurred in line of duty in active service or while serving with the Army pursuant to provisions of this act. (Sec. 47b, National Defense Act, as amended June 4, 1920.)

9. **TRAINING CAMPS.**—The secretary of War is hereby authorized to maintain, upon military reservations or elsewhere, schools or camps for the military instruction and training, with a view to their appointment as reserve officers or noncommissioned officers, of such warrant officers, enlisted men, and civilians as may be selected upon their own application; . . . The Secretary of War is authorized further to prescribe the courses of theoretical and practical instruction to be pursued by persons attending the camps authorized by this section; to fix the periods during which such camps shall be maintained; to prescribe rules and regulations for the government thereof; and to employ thereat officers, warrant officers, and enlisted men of the Regular Army in such numbers and upon such duties as he may designate. (Sec. 47d, National Defense Act, as amended June 4, 1920.)

10. **MISCELLANEOUS PROVISIONS.**— . . . In time of war any officer of the Regular Army may be appointed to higher temporary rank without vacating his permanent commission, such appointments in grades below that of brigadier general being made by the President alone, but all other appointments of officers in time of war shall be in the Officers' Reserve Corps.

Unless special assignment is made by the President under the provisions of the 119th article of war, all officers in the active service of the United States in any grade shall take rank according to date, which, in the case of an officer of the Regular Army, is that stated in his commission or letter of appointment, and, in the case of a reserve officer or an officer of the National Guard called into the service of the United States, shall precede that on which he is placed on active duty by a period equal to the total length of active service which he may have performed in the grade in which called or any higher grade. When dates of rank are the same, precedence shall be determined by length of active commissioned service in the Army. When length of such service is the same, officers of the Regular Army shall take rank among themselves according to their places on the promotion list, preceding reserve and National Guard officers of the same date of rank and length of service, who shall take rank among themselves according to age. . . . (Sec. 127a, National Defense Act, as amended June 4, 1920.)

11. AIR SERVICE, FLYING CADETS.—The Secretary of War is hereby authorized and directed to establish and maintain at one or more established flying schools courses of instruction for aviation students.

Aviation students shall be enlisted in or appointed to the grade of flying cadet, Air Service, which grade is hereby established: *Provided*, That the total number of flying cadets shall not at any time exceed 1,300. The base pay of a flying cadet shall be \$75 per month, including extra pay for flying risk as provided by law. The ration allowance of a flying cadet shall not exceed \$1 per day, and his other allowances shall be those of a private, first class, Air Service.

Upon completion of a course prescribed for flying cadets, each flying cadet, if he so desires, may be discharged and commissioned as a second lieutenant in the Officers' Reserve Corps: *Provided*, That the Secretary of War is authorized to discharge at any time any flying cadet whose discharge shall have been recommended by a board of not less than three officers. (Act of July 11, 1919.)

#### SECTION II

#### GENERAL POLICIES GOVERNING THE OFFICERS' RESERVE CORPS

##### *Appointment*

(For details see Secs. IV to XXI, inclusive)

12. The Officers' Reserve Corps is established for the purpose of providing a reserve of officers available for military service when needed. It is not a separate component of the Army, but is the corps which furnishes the necessary reserve officers for assignment to all components of the Army of the United States. Its members will therefore normally be assigned or attached to authorized organizations of the Army of the United States in time of peace. The numbers of reserve officers assigned or attached to organizations of the Organized Reserves in time of peace will not be limited to the strict requirements of tables of organization, but will include the officers required for replacements and for the formation of such new and additional units as may be required after the initial mobilization. Appointment as a reserve officer is not, in any case, to be the mere conferring of a rank, but is made to fill an office in which service may be rendered. Appointments are not honorary or rewards for past service, but are based primarily upon the qualifications of the appointee to perform satisfactorily the duties of a particular office.

13. In view of the large number of reserve officers needed and the experience had in the World War in developing officer material, it is essential, in building up and maintaining the necessary number, that cognizance be taken of the widely different qualifications required for

filling various offices. Good combat officers are difficult to obtain and should not be used for noncombatant duty if it can be avoided. Conversely, the required technical experts and specialists should be provided and utilized in their proper spheres. With this in mind reserve officers are divided into two general classes.

14. The two general classes of reserve officers are the following:

*a. Officers for Service with Troops.*—This class includes all officers directly concerned with the tactical handling of troops. As there is no vocation in civil life that fully fits any individual for the tactical handling of troops, officers appointed for this class of service must be qualified by military training and experience. They must also be prepared, after appointment, to devote a reasonable amount of time to military instruction and preparation for combat duty, and to the performance of the peace-time duties pertaining to the organizations to which they may be assigned. All officers of Infantry, Cavalry, Field Artillery, and Coast Artillery are in this class. Officers of other branches of the service are in this class only in case of appointment for duty directly concerned with the tactical handling of troops.

*b. Officers for Special Service.*—This class includes officers not concerned with the tactical handling of troops, and, in general, includes those officers whose duties in the Army are along the lines of a profession or occupation in civil life. As their work in civil life, to a great extent, fits such officers for their contemplated service in the Army, they may be appointed largely on their professional or occupational standing and experience. After appointment they should be prepared, in general, to devote such time to military instruction as will enable them to know how their special qualifications fit into and can be best utilized in the military service, and to the performance of the peace-time duties of the organizations to which they may be assigned.

15. For duty with troops military knowledge, leadership, tactical ability, and physical endurance are necessary in addition to the qualities of moral fitness and general education required for all officers. It is not to be expected that new appointees be wholly proficient in all the military details of their offices. The standard for initial appointment is that the appointee should have the requisite basic qualifications as hereafter defined in these regulations and sufficient ability to perfect himself in the duties of the grade and branch of the service to which appointed. In his subsequent service with his organization and during periods of active service for training his progress will be verified, as well as his probable qualification for promotion.

16. For special service the duties involve a limited knowledge of organization and the care and use of troops. The special service, how-

ever, will be along the lines of civil professions or occupations. The primary requisites, in addition to the fundamental qualities of moral fitness and general education, are satisfactory knowledge of and standing in some profession or occupation, with ability to adapt such knowledge to the requirements of military service.

17. In making appointments, the class of duty for which appointment is desired will be given due consideration. Applicants, in submitting applications, and examining boards, in conducting examinations, will be guided by the general principles stated herein.

18. There are three general methods of determining the qualifications of an applicant for appointment:

- (a) Examination of his record;
- (b) Attendance at a course of instruction;
- (c) Personal examination.

The first method applies primarily to persons who have served as officers during the World War and from whose records qualification for appointment may be determined. The second method applies to persons qualifying at training camps, to Reserve Officers' Training Corps students, flying cadets, etc. The third method applies to all persons not covered by the first and second methods.

19. The law confers certain eligibility for appointment on persons who served as officers during the World War. Such appointments can generally be made from an examination of records, but as time elapses records of World War service become less reliable and valuable as evidence of fitness for appointment. Individuals change, as do also the requirements of the military service. Some instruction and training are necessary to keep persons who have served in the Army qualified for service in a future emergency. World War records cannot be accepted for an indefinite time as evidence of qualifications for appointment. Furthermore, after the Officers' Reserve Corps has reached its required strength, vacancies in grades above the lowest should be filled by promotion, rather than by making new appointments. Prompt mobilization in an emergency requires that officers be already enrolled and does not permit of the delay incident to reviewing past records and ascertaining the physical and other fitness of applicants for appointment. World War veterans are needed and their services are urgently desired without delay to assist in the organization and development of the Army of the United States under the provisions of the amended National Defense Act. From a consideration of all factors it has been deemed expedient to place a time limit, until November 11, 1925 (five years after the termination of hostilities), upon the appointment of former officers by an examination of their records alone. After that date World War service



will receive due consideration, but will not, of itself, be accepted as evidence of qualification for appointment, and additional demonstration of qualification by examination will be required. The time limit placed is reasonable and allows ample time for former officers, who so desire, to become members of the Officers' Reserve Corps.

20. The National Defense Act permits officers of the National Guard to hold commissions in the Officers' Reserve Corps. Such dual commissions are desirable, with the understanding that the individual is not thereby placed in the status of a reservist in two capacities. National Guard officers, when appointed in the Officers' Reserve Corps, remain assigned to and receive their training with the National Guard and, in the event of an emergency, will be drafted into Federal service with that component of the Army. When drafted into Federal service, National Guard officers stand discharged from the Militia and, incidentally, of their commissions in the National Guard; and in order that they may be continued as commissioned officers in the military service of the United States, in time of war, they must be given appointments in the Officers' Reserve Corps, if such National Guard officers do not at the time of their being so discharged already hold commissions in the Officers' Reserve Corps. Under the National Defense Act all commissions in time of war, other than those in the Regular Army, must be in the Officers' Reserve Corps. The granting of reserve commissions to National Guard officers in time of peace is thus merely a timely anticipation of action that would be necessary in the event of a draft into Federal service. Through such reserve commissions National Guard officers also have enlarged opportunities for training with other components of the Army of the United States. So far as the law permits the reserve commission will be in the same grade and branch as the National Guard commission. If, for any reason, the reserve commission cannot legally be given the same grade and branch as the National Guard commission, its issue will be deferred and appropriate adjustment made as soon as circumstances permit.

21. One means by which warrant officers and enlisted men of the Regular Army and National Guard may secure appointment in the Officers' Reserve Corps is by qualification at training camps. Many will not have an opportunity to attend these camps, as the funds available and the facilities of the camps will be needed primarily for the development of civilian candidates. Consequently, an opportunity is provided for warrant officers and enlisted men, while serving with their organizations, to be given courses of instruction and training that will fit them for reserve commissions, such courses terminating in an examination for appointment.

22. In appointment, as in other matters pertaining to reserve officers, a policy of decentralization is observed, only sufficient centralized control being retained as is essential to the maintenance of a reasonable degree of uniformity throughout the entire Officers' Reserve Corps. In all cases in which appointment may be made based upon an examination of records only, examinations are conducted in Washington where the records are filed. In all cases requiring a personal examination, the conducting of such examination is delegated to department and corps area commanders. To provide uniform standards throughout the service, the general scope of examinations is prescribed by the War Department. To accommodate to varying conditions, examining boards are authorized to grant such exemptions as, in their judgment, may be desirable to determine details of examination and to make additional investigations, if necessary. With this authority of the boards is coupled a responsibility that they recommend for appointment only those persons who may reasonably be expected to make efficient officers in an emergency. Failure to maintain a proper standard will give rise to a just cause of complaint from reserve officers who expect and who are entitled to the preservation of such a standard, and will indicate a failure to appreciate the outstanding lessons of the World War as to the demand for competent officers and the undesirability of elimination during an emergency.

23. Reserve officers are needed primarily, but not exclusively, for units of the Organized Reserves. They should be assigned, so far as practicable, to units organized near their place of residence. The location and development of units of the Organized Reserves is delegated to department and corps area commanders. Available reserve officers are also allotted to them for assignment. As the organization of units progresses, and it is found that additional officers are needed, it is contemplated that suitable and available officer material will be located and obtained by the department or corps area commanders under some of the means provided for appointment. The procurement of reserve officers for the Organized Reserves is thus largely in the hands of the department or corps area commanders. As soon as practicable a full quota of officers for the Organized Reserves should be procured and maintained, as well as the officers that will be required in emergency for the other components of the Army of the United States.

24. It is contemplated that, so far as practicable, any future mobilization will be largely one of organizations and not of individuals. The reserve officers who have, in time of peace, obligated themselves to service, and who have received training and instruction, will be called to active duty, either with the organization to which they have been assigned, or for the special duty to which they have been assigned in time

of peace. It is not contemplated that persons who have failed to join the Officers' Reserve Corps and to receive instruction in time of peace will be appointed in an emergency until such time as it becomes apparent that the existing reserve of officers is inadequate. Those persons who are appointed and serve in time of peace are thus assured priority for service as officers in war over those who decline or fail to secure appointments in time of peace.

### *Promotion*

(For details see Sec. XVIII)

25. All steps taken in time of peace in the development of the Officers' Reserve Corps, including promotions therein, must be with a view to readiness for the prompt mobilization of an efficient army in time of war. In time of war, after the components of the Army have been called to active service, all officers will be equally eligible for promotion, regardless of whether they have served, in time of peace, in the Regular Army, the National Guard, or the Organized Reserves. Promotion in time of war must, in general, be based upon a method of selection, with due consideration of the needs of the military service and the relative qualifications of persons available for promotion. The promotion system embodied in these regulations is applicable in time of peace only. The system is formulated with a view to giving such promotion as appears reasonable and proper in time of peace, with the understanding that, in time of war, conditions will afford exceptional officers an opportunity, which is lacking in time of peace, to demonstrate clearly their military capacity and fitness for advancement.

26. It is impossible to determine in time of peace the full extent of the qualifications of reserve officers for duty in time of war. Their promotion, in time of peace, must be based upon considerations of their general and professional qualifications, the interest manifested by them, their length of service, and age, with a view to providing reasonable advancement to the grades for which it is believed they will be fitted in time of war and from which they will have a fair and equal opportunity for further advancement under conditions of active service.

27. With a view to developing the interest, ability, and qualities of military leadership of the citizen soldier, the system of promotion is designed to afford any competent reserve officer an opportunity to rise by successive steps to any office in the Army which is to be filled, and for which he has the ability to qualify. With this object in view, no fixed numbers are prescribed for the various grades and branches of the Officers' Reserve Corps. So far as numbers in each grade are concerned

the only restriction placed upon promotions is that there must be a suitable office and duty to which any promoted officer can be assigned.

28. In addition to theoretical training and instruction, an officer, to be qualified for promotion, must have the knowledge and judgment that develop with age and experience. A minimum length of service in a grade is, therefore, required as a condition of eligibility for advancement to the next higher grade. The minimum of one year required by law being of limited application, a minimum of three years' service in a grade is required by these regulations. Of the three years, one must be in the Officers' Reserve Corps as required by law, liberal credit being given toward the other two years for service rendered as an officer during or since the World War. This minimum period, and the service credited thereto, allow an opportunity for promotion commensurate with the time available, interest, and inclination of the officer to apply himself to the acquirement of knowledge of his profession, and also takes cognizance of experience gained in active service during the World War. It is not expected that all reserve officers will be able to qualify for promotion at the expiration of such period; length of service is but one factor in determining qualification for advancement. The actual period of service in any grade prior to promotion will depend upon the capacity and industry of each individual officer as affected by the time that he can spare for military study and training.

29. An officer eligible for promotion is not considered therefor until he signifies his readiness to undergo the examination prescribed. An officer cannot be considered qualified to fill an office in the next higher grade until, by a suitable test, he can demonstrate his professional fitness therefor. Those officers who are eligible for promotion are encouraged to signify their readiness for examination when, but not before, they feel themselves reasonably qualified. Requests or recommendations to be examined for promotion must pass through military channels and will be approved, unless the recommendations made thereon indicate that the officer is not deemed sufficiently qualified to justify examination, or that there is no suitable assignment. In submitting requests or recommendations, it is to the interest of all concerned to avoid the examination of officers who are not reasonably prepared and qualified for examination. As examining boards are required, in case any officer examined is found not qualified for promotion, to inquire into and report upon his qualifications to continue in his grade, it is to the interest of each reserve officer to refrain from signifying his readiness for examination until he feels himself reasonably qualified therefor.

30. Decentralization requires that examinations be conducted by boards convened by the department and corps area commanders. How-

ever, in order to standardize requirements throughout all the corps areas, it is necessary that these examinations be conducted under War Department regulations prescribing their character and scope. At the same time, to provide the necessary elasticity to meet widely varying conditions, the examining boards prescribe the details of examination and are authorized to grant such exemptions, and to make such additional investigations as, in their judgment, may be necessary or proper in any individual case. When their services are obtainable, reserve officers are to be utilized as members of examining boards.

Briefly, the conditions for promotion are:

- (a) A minimum of three years' actual or constructive service in the grade from which promoted;
- (b) A suitable assignment for the officer if promoted;
- (c) A demonstration of qualifications by examination.

#### *Assignment*

(For details see Sec. XV)

31. So far as practicable, it is contemplated that a mobilization of the Army be one of organizations rather than of individuals. To accomplish this and to have all reserve officers understand and be prepared for their specific duties in time of war, all reserve officers will, so far as practicable, be given specific assignments in time of peace. All reserve officers are, in time of peace, under the administrative control of the commander of the department or corps area in which their permanent residences are located. With the exception of a limited number of reserve officers withheld by the War Department, or branches thereof, for special assignments to duties not pertaining to the organizations of a department or corps area, all reserve officers are under the jurisdiction of a department or corps area commander for the purpose of assignment.

32. As a basis upon which to make suitable assignments, the War Department records of each reserve officer are carefully examined by the chief of the branch in which the officer is appointed. The data having a bearing upon the qualifications, suitability, and preference for assignment is placed upon a form suitable for ready use. Except for the few officers retained for assignment by the War Department or branches thereof, the form bearing the assignment data is sent to the department or corps area commander by whom the officer is to be assigned. After the initial classification the forms containing data bearing upon the officer's qualifications will be kept up to date by appropriate entries thereon by the assigning authority. The latter

will afford officers a full opportunity for modifying their preferences and will take the necessary steps to make as complete and accurate as possible the data bearing upon the qualifications of each officer.

33. The specific assignment of each reserve officer is to be determined by the authority authorized to assign him as soon as practicable after receipt of the initial data covering qualifications for assignment. Reserve officers may be assigned or attached to all components of the Army of the United States. Assignments to the Regular Army will be made only as specifically directed by the War Department from time to time. All reserve officers, who are also officers, warrant officers, or enlisted men of the National Guard, will be considered as on duty with that component of the Army and will be given no other assignment as reserve officers. The assignment of other reserve officers to the National Guard will be made only when authorized by the War Department.

34. In making assignments, due consideration will be given to general and special qualifications, limitations as to the kind of duty for which appointed or suited, place of residence and local affiliations, and the preferences of the officers. So far as practicable, all reserve officers are to be assigned to units in the vicinity of their places of residence. However, World War veterans, who so desire, may be assigned to their reconstituted former war organizations in the discretion of department and corps area commanders. In all cases assignment must be within the department or corps area and departures from the general rule must not be permitted if administration, training, or mobilization will be adversely affected. Upon a permanent change of residence a new assignment will be made if necessary, but officers will be retained in their original units or in higher organization of which such units form parts if consistent with the general principles stated above.

35. In making assignments, the normal legal obligation of reserve officers will be kept in mind; that is, the obligation to serve only in a national emergency expressly declared by Congress. In general, therefore, reserve officers will be assigned to units of the Organized Reserves. Assignments involving an obligation to serve in lesser emergencies with other components of the Army of the United States can be made only with the consent of the officers concerned.

36. In view of their dual status and also in view of their availability on short notice in case of an emergency, the use to be made of reserve officers who are also warrant officers or enlisted men of the Regular Army or National Guard will depend on the special circumstances existing on the outbreak of an emergency. Consequently, such officers will not, in general, be given definite war assignments in time of peace. However, since their use as officers is contemplated in an emergency, they

should be given, in time of peace while on duty with their organizations, such training and instruction in the duties of officers as is practicable.

### *Transfers*

(For details see Sec. XV)

37. Transfer from section to section of the Officers' Reserve Corps may be made without change of rank or date of commission when it is recommended by competent authority that a change of section is for the best interests of the Government and the individual.

38. Should a reserve officer, for physical or other reasons, cease to be suited for combat duty, he may often, by transfer, be retained in the service for some other duty for which fitted. Similarly, officers not appointed for combat duty may, by taking advantage of all opportunities for instruction, fit themselves for such duty and, by transfer to a suitable section of the reserve, increase their value to the military establishment. In time of peace transfers will be made only with the consent of the officer concerned.

### *Training*

(For details see Sec. XVII)

39. In order that reserve officers fulfill the purpose for which appointed, it is essential that they receive sufficient training and instruction in time of peace to qualify them for the performance of their duties in an emergency. The amount of training and instruction necessary varies with the experience, rank, and qualifications of individuals, and with the nature of the duties which they will be called upon to perform in an emergency.

40. The training and instruction of reserve officers divides broadly into two general classes: First, training when on active duty, and second, training and instruction when on an inactive status.

41. In time of peace the maximum obligation for active duty for reserve officers is 15 days in any calendar year. However, reserve officers can be ordered to active duty only within the limits of funds appropriated by Congress for this specific purpose. The training projects and programs of the War Department must necessarily be prepared and announced from time to time as appropriations are made. Having in view the limited funds available and the desirability of giving all reserve officers approximately equal facilities for training, the granting of individual requests for training at a particular time cannot, in general, be approved unless they accord with approved training schemes. Should any officer be called for the 15-day training period, he may be exempted from such training if special circumstances warrant.

42. Within the limits of funds and accommodations available, reserve officers will be authorized to attend the various service schools. The attendance at such schools is to be regulated so as to cause a uniform distribution throughout the Organized Reserves of officers who have attended such schools.

43. Reserve officers who also hold commissions in the National Guard will receive their training as officers of the National Guard and will not be included in such training projects as may be provided for other reserve officers.

44. In general, some training and instruction while on an inactive status will be necessary to replace, or to supplement, training received while on active duty. This will, in general, take the form of instruction by Regular Army officers detailed for duty with units of the Organized Reserves, of correspondence courses, or of study engaged in by the officer himself. Organization commanders, department and corps area commanders, and chiefs of branches have a mutual responsibility in accomplishing the training and instruction of reserve officers and will, from time to time, afford these officers such facilities for training and instruction when on an inactive status as circumstances permit. Within the limits of funds that may be utilized for this purpose, the War Department will make available for the use of reserve officers such official publications as are necessary or desirable for their instruction.

#### *Active Duty*

(For details see Sec. XVI)

45. Active duty for reserve officers is of two general classes: First, active duty in a national emergency expressly declared by Congress, and second, active duty in time of peace for training or instruction, or for some duty of a specific nature.

46. The mobilization of the Army in an emergency will be largely one of organizations, and officers will be called to duty with the organizations to which they have previously been assigned. Such warning as circumstances permit will precede a call of this nature, but no specific period of warning can be predetermined. The nature of an emergency, the urgency for troops or officers of a particular class, and the theater of operations must be expected to introduce variations into any predetermined plan.

47. The maximum obligation for active duty in time of peace is 15 days in a calendar year. It will, in general, be impracticable to require this maximum. When officers are to be called for a 15-day training period, they will be given as much advance notice as practicable, and any officer upon whom such a call to duty would work a hardship may



be excused from attendance for that call. Specially selected officers will be called to active duty from time to time for the following duties:

- (a) As additional members of the War Department General Staff;
- (b) To attend the various service schools;
- (c) For duty with organizations of the Regular Army or Organized Reserves;
- (b) As instructors at training camps or schools;
- (c) For consultation, duty on courts-martial or boards, or other duties for which specially qualified.

48. No active duty of the above classes will be required without the consent of the officers concerned. In addition to the consent of the officers, selection will be based upon special fitness and recommendations, and with the view of securing a uniform distribution of specially trained officers throughout the Army. As such active duty is dependent upon appropriations made, facilities available, and other varying factors, it must be controlled by policies formulated and announced from time to time.

49. In justice to the Government and to individuals, it is essential that the physical fitness of reserve officers be determined when they are placed on active duty. While minor physical defects may be waived if the nature of the contemplated duty permits, it is essential that future expense to the Government and interference with military efficiency be avoided, by not placing or retaining on active duty any officer who may become a burden through disability aggravated by service. Any officer, upon reporting for active duty, found disqualified for the performance of any duty will be immediately relieved and returned to inactive status.

50. When on active duty reserve officers are subject to the Articles of War and to assignment to any duty, and receive the pay and allowances provided by law for officers of like grade of the Regular Army. Reserve officers are not entitled to retirement or retired pay, their compensation in the event of disability being otherwise provided for by law.

### *Separation*

(For details see Sec. XIX)

51. The separation of a reserve officer from the service may be either of his own volition or for cause. In time of peace resignations of reserve officers will, in general, be accepted when tendered for any good reason. The period of appointment as a reserve officer is five years. At any time prior to the expiration of the five-year period reserve officers may be discharged for cause. Such discharges will be preceded by suitable

investigations by boards of officers, the membership of which will, when practicable, include reserve officers.

52. In time of war reserve officers will be subject to the same conditions as to separation from the service as are all other officers of the Army, except that only officers of the Regular Army are entitled to retirement. Any reserve officer whose appointment is in effect at the outbreak of war, or whose appointment is made in time of war, is entitled to his discharge within six months of the termination of the war.

### 53. AUTHORIZED SECTIONS.—

#### SECTION III

#### COMPOSITION

##### (n) *Medical Department:*

##### (1) *Dental Officers' Reserve Corps.*

(Abbreviation, Dent-ORC.)

Corresponds to Dental Corps.

##### (2) *Medical Officers' Reserve Corps.*

(Abbreviation, Med-ORC.)

Corresponds to Medical Corps.

##### (3) *Medical Administrative Officers' Reserve Corps.*

(Abbreviation, MA-ORC.)

Corresponds to Medical Administrative Corps.

##### (4) *Sanitary Officers' Reserve Corps.*

(Abbreviation, Sn-ORC.)

This section has no corresponding branch or corps in the Regular Army. The duties of officers embrace special and scientific matters, allied to the duties of the Medical Department, essential to the efficient organization and operation of the Medical Department in time of war.

##### (5) *Veterinary Officers' Reserve Corps.*

(Abbreviation, Vet-ORC.)

Corresponds to Veterinary Corps.

54. AUTHORIZED GRADES.—The authorized grades in which appointments may be made are as follows:

##### (a) General officers. Appointments are subject to confirmation by the Senate.

##### (2) The grade of brigadier general of the staff is authorized in all sections except the Infantry, Cavalry, Field Artillery, and Coast Artillery.

##### (b) Below the grade of brigadier general. Appointments are not subject to confirmation by the Senate.

- (d) Second lieutenant to colonel, inclusive, in all sections except as noted below.
- (b) Judge Advocate General's Section, Medical Section and Dental Section—first lieutenant to colonel, inclusive.
- (c) Medical Administrative Section—second lieutenant to captain, inclusive.

55. NUMBERS IN VARIOUS GRADES AND SECTIONS.—The number of officers in any section or grade is unlimited, subject to the restriction that for each officer appointed or promoted there must be a suitable assignment for duty in the Army of the United States. In the assignment of reserve officers to units of the Organized Reserves, department and corps area commanders may attach reserve officers in any unit area who are in excess of the requirements of the Tables of Organization for the unit formed in that area; and in their discretion may arrange to fill vacancies in any unit from the reserve personnel within its proper unit area without reference to surplus attached officers in other unit areas. Officers attached to reserve organizations in excess of the requirements of Tables of Organization will be considered as available for replacements, for the formation of new organizations, and for any other requirements incident to mobilization.



## SECTION IV

## GENERAL PROVISIONS FOR APPOINTMENT

56. **ELIGIBILITY AND METHOD OF APPOINTMENT.**—All appointees must, in time of peace, be citizens of the United States or of the Philippine Islands, between the ages of 21 and 60 years. Eligibility and general methods of appointment are set forth in the following table. Details relative thereto are stated in the succeeding sections.

Classes of persons	For what eligible	How appointed
(a) Former officers of Regular Army and retired officers. (Sec. XI.)	Any section and any grade not above the highest grade held in the Army.	Upon examination of military records, supplemented by personal examination if necessary.
(b) Officers of the Army of the United States at any time between Apr. 6, 1917, and June 30, 1919. (Sec. IX.)	Any section and any grade not above highest grade held in the Army.	
(c) National Guard officers holding Federal recognition as such on June 4, 1920. (Sec. XII.)	Any section and any grade not above highest grade held in the National Guard on June 4, 1920. Appointments are limited to correspond to grade and branch in National Guard at time of appointment.	
(d) Persons who served in the Army between Apr. 6, 1917, and Nov. 11, 1918, and who demonstrated suitability for and were recommended to be appointed commissioned officers in the Army of the United States during the World War. (Sec. X.)	Any section. Second lieutenant in the Infantry, Cavalry, Field Artillery, Coast Artillery, and Air Service. In a grade not above that for which previously recommended in other sections.	
(e) Graduates of Reserve Officers' Training Corps. (Sec. V.)	Any section and in the lowest grade thereof.	Upon recommendation of professor of military science at institution or camp commander at summer camp.
(f) Graduate flying cadet. (Sec. VI.)	Air Service in lowest grade.	Upon recommendation of board of officers at flying field.
(g) Warrant officers and enlisted men of the Regular Army, National Guard and Enlisted Reserve Corps. (Sec. VIII.)	Any section. Second lieutenant in Infantry, Cavalry, Field Artillery, Coast Artillery, or Air Service. In any grade in other sections.	Upon qualification after completion of course at training camp or instruction while on duty with organizations followed by examination. Also by examination only in sections other than Infantry, Cavalry, Field Artillery, Coast Artillery, and Air Service.

Classes of persons	For what eligible	How appointed
(h) Persons not covered in preceding classes who served in the Army between Apr. 6, 1917, and Nov. 11, 1918. (Sec. X.)	Any section. Second lieutenant in Infantry, Cavalry, Field Artillery, Coast Artillery, or Air Service. In any grade in other sections.	Upon qualification after completion of course at training camp. Also by examination in sections other than Infantry, Cavalry, Field Artillery, Coast Artillery, and Air Service.
(i) Former Reserve officers (Sec. XIV.)	Any section. Former or any lower grade.	Upon their records, supplemented by examination when necessary.
(j) Civilians Note.—To be eligible for appointment in Infantry, Cavalry, Field Artillery, Coast Artillery, and Air Service, civilians must first be, or become, members of one of the preceding classes. (Sec. XIII.)	Any section. Second lieutenant in Infantry, Cavalry, Field Artillery, Coast Artillery, or Air Service. In any grade in other sections.	Upon qualification after completion of course at training camp or training as a flying cadet followed by examination for Infantry, Cavalry, Field Artillery, Coast Artillery, and Air Service. In other sections upon completion of a course at a training camp or by examination.

NOTE.—After Nov. 11, 1923, classes *b*, *c*, and *d* will not be appointed on an examination of records, but must either attend training camps or be personally examined for appointment.

57. PERIOD OF APPOINTMENT.—Appointments in every case shall be for a period of five years unless sooner terminated. An appointment in force at the outbreak of war, or made in time of war, shall continue in force until six months after its termination, should the five-year period for which made terminate prior to that time.

58. REAPPOINTMENT UPON TERMINATION OF APPOINTMENT.—Upon the expiration of the period of appointment, a reappointment without change of grade or section will, in general, be tendered without application.

59. DUAL COMMISSIONS—RESERVE AND NATIONAL GUARD.—Any reserve officer may hold a commission in the National Guard without thereby vacating his reserve commission; and any National Guard officer may hold a commission in the Officers' Reserve Corps without thereby vacating his National Guard commission. Consideration of administration and mobilization required that both commissions held by federally recognized National Guard officers be in the same grade and branch of the service. This policy will be observed in making appointments in the Officers' Reserve Corps.

60. ACCEPTANCE OF APPOINTMENT.—An appointment tendered must be promptly accepted or declined. If acceptance or declination is not

received within sixty days of the tender of appointment, same will be canceled.

61. **WAR DEPARTMENT ACTION.**—In accordance with the provisions of section 5 of the National Defense Act as amended by the act of June 4, 1920, all policies affecting the appointment, assignment, promotion, and discharge of reserve officers will be prepared by committees composed of officers of the War Department General Staff, at least half of whom are reserve officers. The policies outlined by these committees and approved by the Secretary of War constitute the approved policy of the War Department with reference to reserve officers. The personnel bureau of the Adjutant General's Office will act on all matters relating to the appointment, assignment, promotion, and discharge of reserve officers in accordance with such approved policies.

62. **REVIEWING BOARD FOR APPOINTMENT OF GENERAL OFFICERS.**—A board of general officers, including one or more general officers of the Officers' Reserve Corps, will be maintained in the War Department for the purpose of reviewing all applications, reports, records, and recommendations for the appointment of general officers of the Officers' Reserve Corps. The findings and recommendations of the board will be transmitted through the Chief of Staff to the Secretary of War for decision.

#### SECTION V

#### APPOINTMENT OF RESERVE OFFICERS' TRAINING CORPS GRADUATES

63. **GENERAL PROVISIONS.**—Graduates of the Reserve Officers' Training Corps consist of those persons who have completed the course of military instruction prescribed for the unit of the Reserve Officers' Training Corps of which they have been members while attending the educational institution at which the unit is maintained. Such graduates may be appointed as reserve officers upon a satisfactory completion of the course of training prescribed by law and regulation. Appointments are made only in the lowest authorized grade of the section in which appointed and are made only in the section of the Officers' Reserve Corps corresponding to the unit from which the appointee has graduated.

64. **PROCEDURE.**—The professor of military science and tactics at each institution maintaining one or more senior units of the Reserve Officers' Training Corps will, on or about March 1 of each year, forward to The Adjutant General of the Army the following:

(a) A list of the prospective Reserve Officers' Training Corps graduates of that year who, it is believed, will be qualified and eligible for appointment in the Officers' Reserve Corps. This list will be accompanied by a certificate and recommendation in the case of each person named thereon. (See Appendix III, for form of certificate.)

(b) A list of the prospective Reserve Officers' Training Corps graduates of that year who, though believed qualified and eligible for appointment in the Officers' Reserve Corps, it is known will not accept such appointment. This list will be accompanied by the same certificate as referred to in list (a) above.

(c) A list of the prospective Reserve Officers' Training Corps graduates of that year believed qualified for appointment in the Officers' Reserve Corps, but who, at the time of graduation, will be ineligible by reason of not being 21 years of age. This list will be accompanied by the same certificate referred to in list (a) above.

(d) A list of the prospective Reserve Officers' Training Corps graduates of that year believed qualified for appointment in the Officers' Reserve Corps (showing separately those who will be under 21 years of age at the time of their graduation) but who, at the time of graduation, will be ineligible by reason of having been authorized to complete their camp training subsequent to graduation. This list will be accompanied by the same certificate as referred to in list (a) above.

(e) A list of the prospective Reserve Officers' Training Corps graduates of that year who, it is believed, on graduation will not be qualified for appointment in the Officers' Reserve Corps. Opposite each name on the list will appear a brief statement of the reason for disqualification.

65. PREPARATION OF COMMISSIONS.—Upon receipt of the report of the professor of military science and tactics, The Adjutant General of the Army will take the following action:

(a) Prepare and forward to the professor of military science and tactics the commissions, letters of acceptance, oaths of office, and other necessary papers of each person named in list (a) paragraph 64.

(b) Prepare and forward to the professor of military science and tactics a letter of qualification for appointment as a reserve officer of each person named in list (b) paragraph 64. Such a letter will entitle the holder to receive in exchange therefor a reserve commission at any time within five years of the date of the letter, unless in the meantime he becomes, for any reason, disqualified for appointment.

(c) Prepare and forward to the professor of military science and tactics a letter of qualification for appointment as a reserve officer for each person named in list (c) paragraph 64. Such a letter will entitle the holder to receive, in exchange therefor, a reserve commission when he becomes 21 years of age, or upon the outbreak of war prior to his reaching that age, or at any time within five years of the date of the letter, unless in the meantime he becomes, for any reason, disqualified for appointment.

(d) Prepare and forward to the proper Reserve Officers' Training

Corps camp commander the commissions, letters of acceptance, oaths of office, letters of qualification for a reserve commission and other necessary papers of each person named in list (d) paragraph 64.

66. PRESENTATION OF COMMISSIONS.—During the period of commencement, commissions and letters of qualification will be formally presented to those entitled to receive them, at such ceremony as the authorities of the institution may arrange. The oaths of office and other necessary papers of appointees will be accomplished and forwarded by the professor of military science and tactics to The Adjutant General of the Army.

67. PHYSICAL EXAMINATION.—The examination required to determine physical fitness for appointment will normally be conducted at the advance course class or at the institution, before the annual report of qualified graduates is forwarded at the end of the second semester.

68. APPOINTMENT AT TRAINING CAMPS.—Commanders of Reserve Officers' Training Corps camps will cause the papers referred to in paragraph 65 (d) to be accomplished and the commissions and letters of qualification to be presented to those students whose camp training has been satisfactorily pursued.

#### SECTION IX

##### APPOINTMENT OF OFFICERS OF THE WORLD WAR

83. GENERAL PROVISIONS.—Any person who served as an officer of the United States Army at any time between April 6, 1917, and June 30, 1919, may be appointed a reserve officer in the highest grade that he held in the Army or any lower grade. The "highest grade in the Army" as used herein is construed to mean the highest grade in which actually appointed in any component of the United States Army, between April 6, 1917, and date of discharge, and does not include an advance rank or title conferred by virtue of an aviation rating.

84. EXAMINATION.—Until November 11, 1923, the examination for appointment of persons who served as officers of the United States Army at any time between April 6, 1917, and June 30, 1919, will consist of an examination of the applicant's military record and a physical examination, supplemented, when necessary, by a professional examination. After November 11, 1923, no appointments will be made based solely upon an examination of records, and former officers will be examined and appointed under the provisions of Section XIII of these regulations.

85. GRADE.—Appointments will not be made in a grade higher than that previously held in the Army. Whether appointment should be made in the highest grade previously held or in a lower grade, will be



determined from the examination and the elapsed time since active service.

86. APPLICATIONS.—Applications for appointment prior to November 11, 1923, will be prepared in accordance with the form in Appendix I of these regulations and will be submitted to The Adjutant General of the Army through the department or corps area commander. The application will be accompanied by a report of physical examination made preferably by a medical officer of the Army. Applications for appointment after November 11, 1923, will be submitted in accordance with Section XIII.

#### SECTION X

##### APPOINTMENT OF PERSONS WHO SERVED OTHER THAN AS OFFICERS IN THE UNITED STATES ARMY AT ANY TIME BETWEEN APRIL 6, 1917, AND NOVEMBER 11, 1918.

87. GENERAL PROVISIONS.—The law provides that any person who served in the United States Army at any time between April 6, 1917, and November 11, 1918, is eligible for appointment in the Officers' Reserve Corps. Appointment in the Infantry, Cavalry, Field Artillery, Coast Artillery, and Air Service sections can, in time of peace, be made only in the grade of second lieutenant. For purpose of appointment, such persons are divided into two classes—those recommended for appointment as officers prior to discharge and those not so recommended.

88. PERSONS RECOMMENDED FOR APPOINTMENT.—Any person who served between the required dates, who before discharge was recommended for appointment as an officer by the commandant of a training school or by a regimental or higher commander or other competent authority, may, until November 11, 1923, be appointed upon an examination of records and physical examination, supplemented, when necessary, by a professional examination.

89. PERSONS NOT RECOMMENDED FOR APPOINTMENT.—Any person who served between the required dates who is not subject to appointment under the preceding paragraph must establish his qualifications for appointment by attendance at a training camp, or by examination under provisions of Section XIII of these regulations. In the Infantry, Cavalry, Field Artillery, and Coast Artillery sections appointments by examination only will be discontinued November 11, 1923.

90. APPLICATIONS.—Applications submitted under provisions of paragraph 88 should be prepared in accordance with the form in Appendix I of these regulations, and should be submitted to The Adjutant General of the Army through department or corps area commanders, accompanied by suitable evidence of the prior recommenda-

tion for appointment, together with a report of physical examination. The physical examination should be accomplished by a medical officer of the Army. Applications of persons desiring appointment by examination under provisions of Section XIII should be submitted as provided in that section. Applications to qualify for appointment by attendance at a training camp should be submitted to department or corps area commanders in accordance with Special Regulations 44b.

#### SECTION XI

##### APPOINTMENT OF FORMER OFFICERS OF THE REGULAR ARMY

91. GENERAL PROVISIONS.—Any person who has served as an officer of the Regular Army at any time, including retired officers, may be appointed as reserve officer in the highest grade which he has held in the Army or in any lower grade. The grade in which appointment is made will in general be decreased in proportion to the elapsed time between separation from the active list and appointment in the Officers' Reserve Corps. In no case will appointment be made in a grade higher than that previously held in the Army.

92. CLASSES NOT CONSIDERED ELIGIBLE.—The following former Regular Army officers are not considered eligible for appointment in the Officers' Reserve Corps: Dismissed; resigned for the good of the service; dropped from the rolls; retired or discharged under section 24b, National Defense Act, as amended June 4, 1920; those who failed to pass examinations for promotion, or to have provisional appointment made permanent; or those who have been wholly retired. Officers retired for physical disability may be appointed for assignment to such duty as their physical condition permits them to perform.

93. EXAMINATION.—The examination of former Regular Army and retired officers will consist of an examination of the applicant's military records, supplemented by such physical or professional examination, or both, as may be necessary.

94. APPLICATIONS.—Applications will be in letter form and will state the choice of branches of the service, the grade applied for, and the manner of separation from the active list, with any other statement the applicant may desire to present, and will be submitted through department or corps area commanders. If more than one year has elapsed since separation from the active list, or if physical condition was not recorded at time of separation, a report of physical examination by a medical officer of the Regular Army will accompany the application. In other cases, the applicant may either submit a report of physical examination, or a certificate to the effect that to the best of his knowledge and belief no material change has occurred in his physical condition since separation from the active list of the Army.

## SECTION XII

## APPOINTMENT OF COMMISSIONED OFFICERS OF THE NATIONAL GUARD

95. **GENERAL PROVISIONS.**—A federally recognized officer of the National Guard may be appointed in the Officers' Reserve Corps in the same grade and in the same branch or an appropriate corresponding branch as that of the commission held by him in the National Guard, so far as the law permits. In those cases in which appointment in the same grade and the same or a corresponding branch cannot be made under the law, no appointment in the Officers' Reserve Corps will be made. Upon termination of their National Guard commission reserve officers will be considered for such reappointment in the Officers' Reserve Corps as may be necessary to eliminate any advantage or disadvantage resulting from the National Guard service.

96. **READJUSTMENT OF PRESENT OR FUTURE APPOINTMENTS.**—Any reserve officer who holds or receives a commission in the National Guard and is federally recognized thereunder, such National Guard commission differing in grade or branch from his reserve commission, will apply for reappointment in the Officers' Reserve Corps in a grade and branch the same as that of the commission held by him in the National Guard. In all cases in which the law permits, the reserve commission applied for will be granted by transfer, by promotion, or by discharge and reappointment. In any case in which appointment in the same grade and in the same or an appropriate corresponding branch cannot be accomplished under the law, the officer will be discharged from his commission in the Officers' Reserve Corps without prejudice to his reappointment therein when eligible, or when he ceases to hold a National Guard commission. Upon such reappointment due consideration will be given to length of service in the National Guard subsequent to such discharge.

97. **EXAMINATION.**—Federal recognition as an active National Guard officer will, in general, be accepted as evidence of qualification for similar appointment in the Officers' Reserve Corps, additional examination not being required.

98. **APPLICATIONS.**—Applications from federally recognized National Guard officers for appointment or reappointment in the Officers' Reserve Corps will be submitted to The Adjutant General of the Army, through military channels, including the Chief of the Militia Bureau. Applications will be prepared in accordance with the form shown in Appendix I of these regulations. The Chief of the Militia Bureau, in forwarding applications, will supply any information necessary to set forth clearly the National Guard status of the officer, including the establishment of his qualifications for appointment under the provisions of section 75 of the National Defense Act and regulations made thereunder.

99. **OTHER NATIONAL GUARD OFFICERS.**—Officers of the Organized Militia not federally recognized as such, and officers of the National Guard Reserve, may apply for and hold commissions in the Officers' Reserve Corps without regard to their National Guard status. Such applications will be considered and appointments made as provided in these regulations for persons other than National Guard officers.

#### SECTION XIII

##### APPOINTMENT BY EXAMINATION

(NOTE.—This section governs the methods of examination and appointment of all persons not otherwise specifically provided for in other sections of these regulations)

100. **ELIGIBILITY FOR EXAMINATION.**—To be eligible for examination under provisions of this section of the regulations applicants must, in time of peace, fulfill the following conditions:

(a) Be between 21 and 60 years of age and citizens of the United States or Philippine Islands;

(b) Have at least a high-school education or its equivalent;

(c) Have the qualifications set forth in the succeeding paragraph.

101. **QUALIFICATIONS.**—Applicants to be eligible for examination under this section of the regulations must have had service as officers in the performance of duties pertaining to the branch for which examined, or in the absence of such service as officers must have the qualifications stated below for the branch for which examined:

(n) *Medical Department:*

(1) *Dental Officers' Reserve Corps.*—Graduates of recognized dental schools, legally qualified practitioners in the states in which they reside, and engaged in the practice of their profession.

(2) *Medical Officers' Reserve Corps.*—Graduates of reputable medical schools which are legally authorized to confer the degree of M. D. or persons who are legally qualified practitioners in the states in which they reside and are engaged in the practice of their profession; also persons who have served satisfactorily for one year as internes in army hospitals.

(3) *Medical Administrative Officers' Reserve Corps.*—Persons having at least two years' practical experience in administrative duties pertaining to the Medical Department.

(4) *Sanitary Officers' Reserve Corps.*—Persons of broad experience and ability who have had at least two years' practical experience in professions or occupations allied to special duties of the Medical Department, exclusive of administrative duties.

(5) *Veterinary Officers' Reserve Corps*.—Graduates of reputable veterinary schools, who are qualified practitioners of the state in which they reside and engaged in the active practice of their profession.

102. *APPLICATIONS*.—Applications will be prepared in accordance with the form provided in Appendix II of these regulations. The section in which appointment is desired and the grade for which the applicant desires to be examined will be stated. The facts upon which the applicant relies to establish his eligibility and qualifications for the appointment he seeks will also be stated. If appointment is sought with a view to assignment to a particular unit of the Organized Reserves, that fact will be stated. Applications may be submitted direct to department or corps area commanders or at any military station for transmission to such commanders.

103. *APPROVAL OF APPLICATIONS*.—The approval of applications for examinations is a function of department and corps area commanders and of such staff officers and organization commanders as are designated by department and corps area commanders. In those cases in which examination for a section or grade differing from that for which application is made is deemed advisable, the approval of application will be modified accordingly, the applicant being informed of the reasons for such modification. Upon approval of any application, the approving authority will inform the applicant when and where to report for examination.

104. *TIME AND PLACE OF EXAMINATIONS*.—Department and corps area commanders are charged with convening examining boards and conducting examinations. All candidates will be examined as soon as practicable after approval of applications, and as near as practicable to their places of residence. Boards may be convened by a department and corps area commander at places within his territorial jurisdiction otherwise exempted from his control.

105. *EXAMINING BOARDS*.—Examining boards will consist normally of three officers of grades not lower than that for which the candidate is examined. If the exigencies of the service demand, boards of a less number of officers may be convened. When practicable, reserve officers may be utilized as members of examining boards but will not be placed on active duty for this purpose. A medical officer may be detailed as a member of the board, but this is not required, as the board may consider a report of physical examination by any medical officer of the Army of the United States.

106. *REPORTS OF BOARDS*.—Upon completion of the examination, the board will prepare a report in each case embodying:

(a) Membership of the board;

(b) Conclusion of the board stated separately as to the physical, moral, professional, and mental fitness of the candidate;

(c) Statements of any other facts that should be of record for the information of higher authority. If, as a result of examination, appointment is desirable in a section or grade other than that for which authorized to be examined, the report will so state.

107. **DISPOSITION OF REPORTS.**—The report of the board will be sent without delay to the convening authority, who will revise the proceedings and promptly forward same to The Adjutant General of the Army through the department or corps area commander.

108. **SCOPE OF EXAMINATION.**—In determining fitness for appointment, the board will examine into the following in such order as it desires:

- (a) Physical fitness;
- (b) Moral character;
- (c) General fitness;
- (d) Professional fitness.

Regardless of physical or other disqualifications, the examination of each candidate will be completed, unless, upon being informed of such disqualification, he requests that his examination be discontinued.

109. **PHYSICAL EXAMINATION.**—Each candidate will be subjected to a thorough physical examination conforming to the standards prescribed by the War Department. The examination may be conducted by any suitable medical officer of the Army. The physical examination will be made as directed by the department or corps area commander, or, in the absence of instructions by him, as directed by the board. The examination may take place either at the time application is submitted, or at any convenient time thereafter, and is not required to be made at the place of meeting of the board. The examining medical officer and the examining board may make such recommendations as they believe to be in the best interests of the service relative to waiving physical defects. Physical defects must be recorded and made known to the candidate by the examining board, who will also inform him that final decision concerning waiver of physical defects rests with the War Department.

110. **MORAL CHARACTER.**—The board will inquire into the moral character of the candidate. Each candidate will be required to submit to the board letters of recommendation from persons in the best position to know his reputation. The board will not confine its inquiry to the recommendations submitted, but will carefully question and judge the candidate, and will secure any additional information from reliable sources that will be of value to the board or higher authority, in determining the moral character of the candidate.

111. **GENERAL FITNESS.**—The board will carefully investigate and weigh the candidate's general education, personality, appearance, tact, bearing, experience, and general adaptability to the military service. The minimum educational requirement for all grades and branches of the service is, in general, a high school education or its equivalent. In determining sufficiency of education, boards will take into consideration the character of service which the appointee may be called upon to perform, according to grade and branch of the service. Any doubt existing in the minds of the board will be removed by an examination of the candidate in such educational subjects as the board may deem necessary.

112. **PROFESSIONAL FITNESS—GENERAL PRINCIPLES.**—In selecting appointees for the Reserve Corps, the purposes for which the corps has been established, that is “. . . to provide a reserve of officers available for military service when needed,” will be kept in mind by all concerned. It is desired to secure in sufficient numbers the best obtainable officer material, consisting of persons qualified to hold positions as leaders or, as technical experts. It is not to be expected that reserve officers shall at all times be proficient in all military details of their offices, but it is expected that they shall possess those qualities which will enable them to become proficient when the necessity arises. Therefore a candidate for appointment who has the basic qualities and potential possibilities for making an efficient officer will not be rejected for lack of detailed technical military knowledge such as he may acquire in reasonable time after his appointment.

No persons will be appointed in any grade for assignment to duties defined as “Service with troops,” unless he has had military training which, in the opinion of the board, fits him for duty with troops.

Officers intended for assignment to duties defined as “Special service” may be appointed without prior military training, provided their suitability and fitness to perform the duties of the position to which they may be assigned is clearly established before the board.

The general scope of the examination is prescribed in subsequent paragraphs. The specific questions or tests to be applied or exemptions in subjects or part of subjects in any case are left to the discretion of the examining board. In considering exemptions, boards will take into account personality, experience, age, credentials submitted, and any other essential factors. The examination in any subject will be varied by the board in accordance with the duties of the office and the grade for which the candidate is being examined.

In all cases the board will investigate and consider both the civil and military experience of the candidate and his standing and proficiency in

his civil occupation or profession. Boards will exercise the discretion given them as to scope and character of examinations to fit the examination in each case to that needed to determine the suitability of the individual candidate for the appointment sought by him.

113. EXAMINATION.—The examination as to professional fitness is generally divided into two parts—

*Part A.*—Basic military subjects.

*Part B.*—Special subjects applicable to the branch for which examined.

The examination on any part thereof may be oral or written, or both. Practical problems and tests will be utilized so far as practicable. Should exemption be granted, this fact and the basis thereof will be stated in the report of the board for the information of higher authority.

#### 114. GENERAL SCOPE OF PROFESSIONAL EXAMINATION—PART A.—

(1) The basic subjects required for appointees for "Service with troops" for all branches of the Army are as follows:

Subject.	General scope.
Administration	The general provisions of regulations and orders pertaining to the administration, equipment, and supply of the unit appropriate to the grade for which examined. The general provisions of the Manual of Courts-Martial covering procedure and duties of members of courts-martial, the means of disciplinary action and their application in a unit appropriate to the grade for which examined.
Military law	
Field Service Regulations and Minor Tactics.	Practical problems involving the fundamental principles of field operations by a unit appropriate to the grade for which examined.
Customs of the service, courtesy, and military discipline.	An understanding of the most essential customs of the service; the courtesy expected of all officers; the purpose of discipline and the best means by which maintained.
Interior guard duty	A general knowledge of the performance of interior guard duty and the functions and duties of an interior guard.
Military hygiene.	General knowledge of sanitary principles, selection of camps and billets, disease preventive measures, and the preservation of the health of a command.
Topography.	General knowledge of preparation, reading and utilization of topographical maps and sketches.
Practical efficiency	Demonstrated or estimated ability to command and efficiently administer a unit appropriate to the grade for which examined. When demonstration is impracticable, estimate will be based upon the degree of success obtained in past experience, civil and military, and upon the personality of the candidate.



(2) The basic subjects required for appointees for "Special service" for all branches of the Army are as follows:

Subject.	General scope.
Administration	General knowledge of regulations applicable to the officer as an individual; channels of correspondence; care and use of government property.
Customs of the service, courtesy, and military discipline.	An understanding of the most essential customs of the service; the courtesy expected of all officers; the purpose of discipline and means by which maintained.
Military hygiene.	General knowledge of personal hygiene in the field and the conservation of the health of individuals and groups.
Practical efficiency	Demonstrated or estimated ability to put to practical use, in the capacity for which appointed, the knowledge possessed.

(3) Any of the above basic subjects also listed in Part B of the examination will be omitted from Part A, as a duplication of examination in any subject is not contemplated.

115. GENERAL SCOPE OF PROFESSIONAL EXAMINATION—PART B.—The board will conduct only such an examination as is necessary to determine whether or not the candidate will make a satisfactory reserve officer in the grade and branch for which he is being examined. In the absence of positive information to the contrary, the board will be governed by the assumption that the special qualifications of any candidate for special service can be utilized in the branch of the service for which he is authorized to be examined; final decision in this matter will be made when the reports of examination are considered by the chiefs of branches of the service. Appointments or examinations for special service are not authorized for the Infantry, Cavalry, Field Artillery, or Coast Artillery.

(14) *Medical Department:*

(a) *Dental Officers' Reserve Corps.*—General knowledge of the profession of dentistry. Such general knowledge to be determined from credentials submitted.

(b) *Medical Officers' Reserve Corps.*—General knowledge of the profession of medicine or surgery. Such general knowledge to be determined from credentials submitted.

(c) *Medical Administrative Officers' Reserve Corps.*—General knowledge in administration work of the Medical Department. Such general knowledge to be determined from credentials submitted, by examination, or both.

(d) *Sanitary Officers' Reserve Corps.*—General knowledge of sanitary engineering, procurement of medical supplies, or other profession or

occupation fitting the candidate for special duties of the Medical Department not performed by other branches thereof. Such general knowledge to be determined by credentials submitted, by examination, or both.

(c) *Veterinary Officers' Reserve Corps*.—General knowledge of the profession of veterinary surgery. Such general knowledge to be determined from credentials submitted.

#### SECTION XIV

##### REAPPOINTMENT OF FORMER RESERVE OFFICERS

116. GENERAL PROVISIONS.—Former officers of the Officers' Reserve Corps or of the Medical Reserve Corps may be reappointed in the Officers' Reserve Corps in the section for which qualified and in the grade, not above the highest grade previously held by them, for which they are eligible under the law and regulations in effect at the time of reappointment. Reappointment in the highest grade previously held will, in general, be limited to persons whose applications are received within three years of separation from the Officers' Reserve Corps. In other cases the appropriate lower grade will be determined in accordance with the elapsed time between separation and application for reappointment.

117. EXAMINATION.—Examination for reappointment will consist, in general, of an examination of the applicant's record, supplemented by physical examination and, in any case where deemed necessary, by a professional examination.

118. APPLICATIONS.—Applications will be forwarded to The Adjutant General of the Army through department or corps area commander and will contain full information as to prior service and a statement of the grade and section in which reappointment is requested. The application should, to avoid delay, be accompanied by a report of physical examination, preferably by a medical officer of the Army.

119. REAPPOINTMENT OF FORMER RESERVE NATIONAL GUARD OFFICERS.—Reserve officers who have been granted commissions in the Officers' Reserve Corps corresponding to their National Guard commissions will, upon termination of status as active National Guard officers, be considered for retention or reappointment in the Officers' Reserve Corps in accordance with the following conditions:

(a) The chief of the Militia Bureau will make prompt report to The Adjutant General of the Army of the name and cause of separation of any reserve officer who ceases to be an active National Guard officer. If such separation is not due to misconduct or inefficiency, The Adjutant General will determine whether or not the officer would receive an

advantage or would suffer a disadvantage with respect to other reserve officers by remaining in his present grade in the Officers' Reserve Corps.

(b) In cases where there is no advantage or disadvantage, the officer will be notified, through the proper department or corps area commander, that he will be continued under his existing reserve commission and will be given an assignment other than with the National Guard, unless he expresses a desire for termination of his reserve commission.

(c) In cases of advantage or disadvantage to the officer by continuance under his existing commission, The Adjutant General of the Army will determine the suitable grade for reappointment. The officer will be informed through the department or corps area commander of the new grade deemed suitable in his case. Should the officer not desire to continue as a reserve officer in such grade he will, upon receipt of statement from him to that effect, be discharged. Should the officer desire the reappointment, he will apply therefor. The application will be forwarded by the department or corps area commander with his recommendation and, if reappointment is to be in a higher grade, the application will be accompanied by the report of an examining board.

(d) Examining boards and others concerned, in reaching findings or making recommendations, will exercise care that no applicant receives an advantage or suffers any disadvantage by reason of having held a reserve appointment corresponding to his National Guard commission. In determining qualifications, due consideration will be given to experience and service in the National Guard.

*(To be concluded)*

## CONCERNING PSYCHOLOGICAL TESTS<sup>1</sup>

A perusal of the various works on experimental psychology will convince most readers that it is possible to gain considerable information concerning the workings of the mind, and to time or otherwise measure many of its processes.

There is, therefore, nothing inherently improbable in the so-called Alpha test. The question is merely: Is it a sufficiently accurate measure of the intelligence to be of value to the Army?

Most of us have a cheap ruler in our desks, and draw with it or measure various objects to our complete satisfaction. A physicist or a mechanic who is accustomed to measure to the thousandth of an inch would say that such a ruler was extremely crude. Yet for most practical purposes fine measurements are of no value. When we wish to

<sup>1</sup> We publish the above comment by Lieut. Col. E. B. Vedder, M. C., U. S. Army, as bearing on the article "Opinions Based on Intelligent Tests" by Maj. Alexander T. Cooper, M. C., U. S. A., published on page 660 of the December, 1921, issue of THE MILITARY SURGEON.—THE EDITOR.

mail a letter, we do not want the weight in thousandth of milligrams, but in ounces or fractions thereof. Should we admit that the Alpha test is not a complete or highly accurate measure of intelligence, nevertheless, it may serve our purpose very well. Whether it does or does not can only be determined by experience. It appears that its use during the war gave satisfactory results, on the whole, and it would at least be interesting to give the method a further trial in large detachments where it is impossible to form an opinion of all the men by personal acquaintance.

It appears that the test is liable to give too low results rather than too high. Abilities develop with constant use just as muscles develop with exercise. Conceivably, a man of good native intelligence who had had little occasion to use it might be graded somewhat below his real worth. This would not be serious in the long run, as brains undoubtedly seek their proper level just as water does. Indeed all that can be claimed of the Alpha test is that it will probably enable brains to reach their proper level rather faster. As the test can be given to an entire detachment in an hour, this would be well worth while.

There is no money incentive in the Army, the pay being about the same whether a man works well or ill, and as the Army is now constituted a promotion is about as hard to obtain as a congressional medal of honor. But perhaps the most enduring satisfaction in life is to receive an opportunity to use whatever talents we may have and to see that good work is appreciated. Under these circumstances most men will be contented, even though they are not paid all they are worth. On the other hand, a man who is denied the use of his abilities is almost sure to be disgruntled.

Much may be done even in the absence of psychological tests to place a man properly. Ask him what work he would like to do. It is an observed fact that we like to do the things that we do best. Perhaps this is only the eternal Ego trying to demonstrate our superiority, to ourselves, if to no one else. But if you can only get that pestiferous Ego to betray himself, you may put the man at work to his own benefit and that of his long-suffering fellows.

#### ANYONE ELSE ANYTHING TO SAY?

*December 7, 1921.*

COL. JAMES ROHN CHURCH,

*Army Medical Museum, Washington, D. C.*

SIR:

Allow me to thank you for your very excellent editorial in the current number of *THE MILITARY SURGEON*; it is quite to the point. I wish that

we could "educate the dog" into realizing what a happy family our Army was prior to the "late unpleasantness."

I have been in the service nearly twenty-four years and during that time have served with many different types of men as officers. In no single instance can I recall not being treated with such consideration as my character and the character of my services deserved.

It has been my pleasure to serve with such medical officers as . . . and of the younger generation . . . and many others. Each in his way had his own peculiarities which made him himself, but never have I had occasion to say that they were either arrogant or discourteous. I pride myself in feeling that these men, as well as many line officers, are my friends, and trust that they may be so as long as we may live.

MASTER SERGEANT,  
*Medical Department, U. S. A.*

## NATIONAL BOARD OF MEDICAL EXAMINERS

FOUNDED 1915 BY WILLIAM L. RODMAN, M. D.

The first examination of the National Board, under the new plan, in Parts I and II will be held as follows: Part I, February 15, 16 and 17 (1922) inclusive. Part II, February 20 and 21 (1922) inclusive.

Applications for examination should be received no later than January 15, 1922. Application blanks and circulars of information may be had by writing to the secretary, Dr. J. S. Rodman, 1310 Medical Arts Building, Philadelphia, Pa.



## BOOK REVIEWS

**DISEASES OF THE DIGESTIVE ORGANS, WITH SPECIAL REFERENCE TO THEIR DIAGNOSIS AND TREATMENT,** by Charles D. Aaron, Sc.D., M.D., F.A.C.P., Professor of Gastroenterology and Dietetics in the Detroit College of Medicine and Surgery; Consulting Gastroenterologist to Harper Hospital. Third edition, thoroughly revised. Illustrated with 164 engravings, 48 roentgenogravures and 13 colored plates. Pp. 504. Price, \$10.00. Philadelphia and New York: Lea and Febiger, 1921.

The present edition of Dr. Aaron's work includes a considerable amount of new material embracing the progress made in the branch of gastroenterology. There is a detailed account of diseases of the mouth, pharynx, esophagus, stomach, liver, gall bladder, bile ducts, pancreas, small intestine, vermiform appendix, cecum, colon, sigmoid flexure, rectum and anus. The description of diseases of the digestive system brings one into intimate association with diseases of other related body organs, and a successful course of treatment directed to the gastro-intestinal tract must also take into account the related organs, the disease of which may give referable symptoms. This book stresses this relationship to give a true picture of the pathology and an interpretation of the symptoms referred to the gastro-intestinal canal.

The practical tests employed in diagnosing diseases of the stomach, duodenum, intestines, have been described in detail and further amplified by many roentgenograms and colored plates. Methods in detail for analysis of duodenal feeding, lavage, and examinations of contents have been set forth in a chapter devoted to this recent advance in internal medicine. Roentgenography has been universally recognized as an invaluable adjuvant in the diagnosis of diseases of the esophagus, stomach, and intestines, and an entire chapter has been given over to this important method illustrated with reproductions of X-ray pictures.

This book is most complete in its contents, and among other subjects covered are those of dietetics, massage, hydrotherapy, focal infection and its relation to diseases of the gastro-intestinal canal, functional or nervous derangements of the digestive organs, the treatment of visceroptosis, intestinal toxemia, chronic constipation, animal parasitic infection, diagnosis and treatment of diseases of the rectum and anus.

The book will be found of great practical value not only to the specialist in diseases of the digestive organs, but also to the internist and to the surgeon.

L. A. NEWFIELD, M.D.







Yours most sincerely  
Robert Jackson



# THE MILITARY SURGEON

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ROBERT JACKSON, M. D., LATE INSPECTOR-GENERAL  
OF ARMY HOSPITALS

BY LE ROY CRUMMER, M. D., OMAHA

(With four illustrations)

WHILE stationed at Camp Greenleaf in 1918, as instructor in the School of Military Medicine, I found by chance in an old bookshop in Chattanooga, "A Treatise on the Fevers of Jamaica, with Some Observations on the Intermitting Fevers of America, and an Appendix, containing Some Hints on the Means of Preserving the Health of Soldiers in Hot Climates. By Robert Jackson, M.D., Philadelphia, 1795."

As I sat on the cool porch of my lecture room, where I could watch my colleagues drilling in the heat of the parade ground, it was a great delight to read from Jackson's book, a century and a quarter old, such observations as these:

Exercises which might inure the body to hardships, have not been sufficiently enforced. . . .

But as I have just mentioned, that spirituous liquors have little claim to be considered among the number of those things which contribute to the preservation of health. . . .

It would be proper perhaps that the surgeon reviewed the men daily. . . .

Round white hats would be the most proper covering for the head; and dowlas might be substituted with advantage in room of the thick cloth of which the coats are usually made. There can be no grounds for supposing that a soldier will not fight as well in dowlas as in scarlet: and there is certain proof that he will perform duties, which require exertion, with greater safety and effect, as the nature of his clothing will preserve him cooler by some degrees. . . . In the present rage for military shew, it will be a difficult task to convince men to lay aside an uniform, which adds much to the brilliancy of his appearance. . . .

I should incur a charge of presumption, perhaps of ignorance, did I attempt to point out the exercises which are the most proper for the forming of soldiers. Those only which contribute to the preservation of health belong to this place. I may however remark that the essential part of the art of disciplining troops consists in imparting sentiments of heroism and virtue to the minds of the men, and improving the exertions of their limbs, and in acquiring knowledge of the correspondence of their exertions when called into action. If I durst take so great

a liberty, I should be inclined to say that our ordinary exercises are flat and insipid in their nature; they occasion no exertions and excite no emulation: they neither improve the active powers of the body nor inure the soldier to bear fatigue and hardship. . . .

Sloth and indolence are the bane of a soldier in every climate; exercise and action are the greatest preservatives of discipline and of health. . . .

But everyone knows that walking, running, wrestling, leaping, fencing and swimming, are often called into actual use in the practice of war. These are such exercises likewise as excite emulation, and are practiced with pleasure by the individual. They harden the body, increase the power of the limbs, and by furnishing the officer with a view of the different degrees of activity, may often enable him to place his men in the ranks, according to the uniformity of their exertions: a more useful mode of arrangement in time of action, than uniformity of exterior form. . . .

Handling a knife in reality is the least part of a regimental surgeon's duty. . . .

And as I read, I realized that here before me, and also in all the other training camps in America, the ideas of Robert Jackson on army discipline were being carried on for the first time in the entire history of wars. Naturally, a keen interest was aroused in the personality of this prophetic army surgeon, and my inquiry disclosed a man of wonderful personality, with a broad comprehension of the duties of a military surgeon; an author of no mean repute in his day, but one who had been quickly forgotten; a hygienist who had made many innovations and advances in medical science, most of which have since been erroneously attributed to other authors; a gentleman who had come in contact with the brightest minds of his day, and not to his own disadvantage. Dr. Jackson was rather pugnacious in disposition and at times insubordinate, but in the long run he was generally on the right side of his controversies. I am sure that some of the details of his life and achievements will be of interest to others who are amateurs of the neglected incidents of medical history.

Robert Jackson was born in Scotland in 1750. At the age of eighteen he matriculated in the medical school of the University of Edinburgh and remained there for three years. This was at the time of the height of the popularity of the university, when Monro, primus, Cullen and Black were all teachers. In 1774 he went to Jamaica as assistant to Dr. King at Savannah-la-Mar, where he first came in contact with the British Army, in which Dr. King was then serving as contract surgeon. He left Jamaica in 1778, going to New York, where he became attached to the 71st Regiment (British). He served through the southern campaign until captured and paroled in 1782, when he returned to

Edinburgh. He was mustered out with his regiment in 1784, and in the same year married the well-dowered daughter of Dr. Stephenson. He then went to the Continent to continue his medical studies and in 1785 was graduated at Leyden. Returning to Scotland, he was in private practice until 1793, when he again entered the army, continuing his military career with occasional interruptions until his return from Jamaica in 1815. He died in 1827.

Dr. Jackson was possessed with a strong *wanderlust*, and while in these days of convenient traveling facilities it would be easy to repeat his journeys, a slight consideration of his odyssey will show the broad foundation he had for training his powers of observation, which were by nature unusually accurate. The two summers intervening during his course at Edinburgh were spent as a surgeon on a whaling vessel in Greenland waters. In 1774 he went to Jamaica, as before mentioned, where he had his first opportunity to study fevers intensively. In 1778, desiring to embark for New York, he walked across the island of Jamaica. On reaching New York he joined the 71st Regiment. At the time, the regiment was stationed in and around New York, but was soon ordered south, and went through the entire campaign, which embraced Virginia, the Carolinas and Georgia. During this time, Jackson carefully studied the fevers of the southern states. He was taken prisoner in 1782 and, after his parole, walked to New York and sailed for Edinburgh. After but a short stay he went on foot to London, making the same trip which his countryman, Dr. Smollet, made some years before. After a few weeks spent in London he decided to visit the Continent, and so, like Goldsmith but without the flute, he made a walking tour of many countries which lasted for some seven months.

His *wanderjahr* took him from Calais to Paris, to Geneva, through Switzerland by way of Moret, Berne and Schaffhausen, then across Germany into Austria. At Gunzburg he was arrested as a vagrant and almost impressed into the emperor's army, but through the efforts of the local commandant was released and continued his trip to Augsburg, Munich, and thence south through the Tyrol, to Innsbruck and Primolana on his way to Venice. He crossed Italy, visiting Padua and Volta; he went through Lombardy to Genoa. From here he walked to Albenga, Toulon, Marseille, Aix, Montpellier, Rochefort, Rochelle and Nantes, then to San Maleo, thence by boat to Guernsey and Southampton—a trip of some 5,000 miles in all.

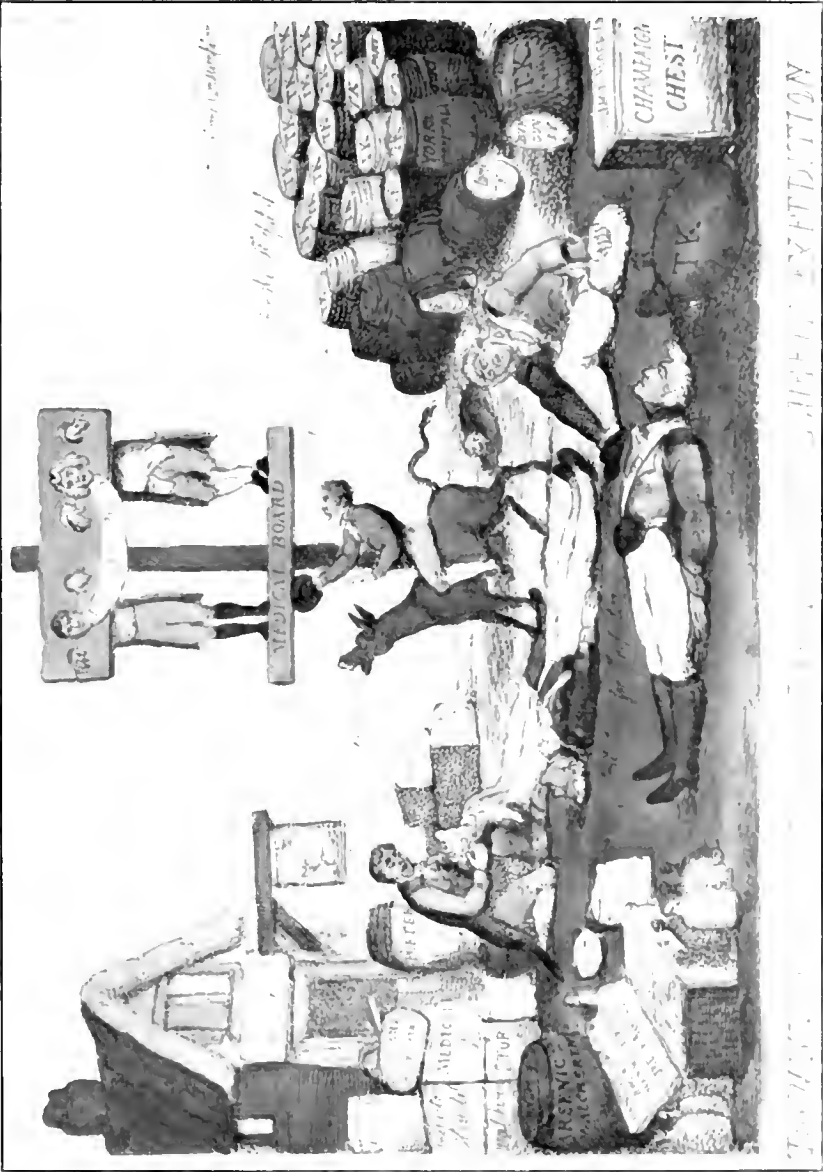
Arriving in London, he learned that his old regiment was about to be disbanded at Perth, so went there and was mustered out. He then made a pedestrian tour of the highlands before returning to Edinburgh. It was during this visit to Edinburgh that he was married, and almost

immediately he returned to Paris, where he studied for several months, working particularly at the Charité. He continued his medical studies at Brussels and finally took his degree of Doctor of Medicine at Leyden in 1785. For eight years he was established in private practice at Stockton-on-Tees.

In 1793 he rejoined the army on the promise of being again sent to the West Indies, but his regiment, while stationed in Jersey, was ordered to Flanders. Dr. Jackson accompanied the regiment there, taking part in the full campaign until he was ordered to take charge of the sick who were to be returned from Bremen to England. In 1796 he was again ordered to the West Indies, where he served until 1798, when, with his friend and biographer, Dr. Borland, he returned to England, traveling via America, the avowed object of the trip being to visit Dr. Benjamin Rush in Philadelphia. He entered the service again in 1800, being assigned to home duty, but in 1802 was forced to retire as a result of a controversy with Mr. Keate and Sir Lucas Pepys. In 1811 he again joined the army and was sent to the West Indies, where he remained until 1815, when he returned to England and private practice. In 1819, intrigued by the report of yellow fever at Cadiz, Jackson offered, through the Director General of the Army Medical Department, to make an investigation of this epidemic, to determine if it was the same disease he had so carefully observed in the West Indies. He was, however, unable to proceed from Gibraltar on account of an insurrection in Spain, so he determined to visit the Levant, proceeding from Gibraltar to Malta, thence to Constantinople, to Smyrna and Athens, visiting many of the surrounding islands before returning. Anticipating a fresh outbreak of the epidemic in the late summer at Cadiz, he so timed his return trip that he arrived there on the very day that yellow fever was officially reported. He remained two months at Cadiz, going from there to Xeres to complete his studies before returning to England.

It might be interesting to note that, under almost the same circumstances in 1842, Larrey solicited the Minister of War for an appointment to inspect the hospitals at Algiers. Larrey at sixty-seven was still interested in his hospitals as Jackson at sixty-nine was interested in fevers. Both sought the object of their quest along the shores of the Mediterranean, but Jackson was more fortunate, since he was able to return and finish his report, while Larrey died at Lyons before he could reach Paris.

Dr. Jackson possessed an inherent gift for languages. On the Greenland whaler he spent all his spare time in his small and grimy cabin studying the Fathers of Medicine in the original Greek and Latin. He was intensely interested in the Gaelic language, and while with his

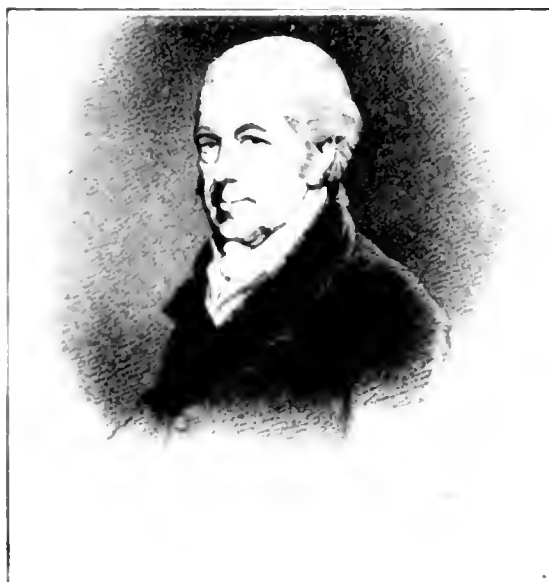


To face p. 110

COPY OF CARICATURE PUBLISHED IN LONDON, 1840, SIGNED BY T



MRS. MARY ANN CLARKE



regiment at Perth he found a Gaelic grammar and gained sufficient knowledge of the language to read Ossian in the original, and even to take part in the controversy then raging over McPherson's alleged discovery. Thus he, a Lowlander, acquired the Highland dialect. His years in Jamaica were sufficient to teach him Spanish, and during his trip on the continent he learned to speak French, German and Italian. While in Paris in 1784 he studied Arabic and thus, at one time or another, obtained a reading knowledge of most of the vernacular languages of Europe as well as the languages of science. He prided himself on reading all books in the original, and after his final retirement from the army it was his great pleasure to compare the translations of the Bible into the different languages with the original. He was quite a bibliophile and had reason to be proud of a large and carefully selected library, which included most of the Masters of Medicine from Hippocrates down.

His professional interests from first to last were devoted to the study of fevers, and his accurate observations are astonishing even today. As one reads his description of the fevers of Jamaica, or the intermittent fevers of America, one constantly expects to see upon the printed page the word "mosquito." Looking back over the long history of intermittent fevers, it is surprising how many medical men have almost made this great discovery. Dr. Jackson studied yellow fever intensively at many times and in many places. His interest in this subject began in Jamaica in 1774, and in 1819, at the age of sixty-nine, he went to Spain to investigate the epidemic raging there—nearly a half century of intensive Sydenham-like study of fevers. In his very first accounts he states that he had none of the classical authorities at hand and so was forced to record only his own observations. He states in his preface to "*Fevers of Jamaica*":

It may appear, perhaps, that I have treated the opinions of great names with too little respect; but if facts have at any time occurred to me, which contradict established theories, I hope that these facts will be examined before they are rejected. No medical authority ought to prevail over the certain evidence of truth.

His accuracy of observation and his defiance of authority were characteristic traits throughout his career. No better example of the latter need be given than his attitude toward Sir John Pringle, at that time the highest possible authority in matters of military sanitation. Again quoting from "*Fevers of Jamaica*":

Nor perhaps should I have thought it necessary even to have mentioned the subject, were it not to take notice of some opinions of the late Sir John Pringle, which appear to have been formed too precipi-

tately; and which, I can affirm from experience, have been pernicious to the health of thousands. . . .

The opinion of Sir John Pringle on this head (which, in fact, is an opinion of theory rather than of observation) has been followed too long without examination.

His professional reputation rests in the main upon his advocacy of the treatment of fevers by cold water. Even as late as our Civil War he was recognized as the discoverer of this form of treatment, and his opinions are quoted some fifty times in "The Medical and Surgical History of the War of the Rebellion."

James Currie usually has had credit for originating the water cure of fevers, an idea which he first presented in his "Medical Reports on the Effects of Water as a Remedy in Fevers and other Diseases, Liverpool, 1798." Jackson very properly disputes this claim and points to much earlier contributions of his own which presented the same idea, and also claims greater precision of method in application of this severe hydrotherapy. This point of priority is now only one of historical interest, but it aroused a considerable controversy in the early years of the nineteenth century. As near as one can come to the truth of the matter, it seems that a mysterious ship captain suggested this form of treatment to both Currie and Jackson and demonstrated its efficiency by sousing buckets of cold sea water over a poor sailor in the height of a malarial paroxysm.

While Jackson's observations on the water cure of fevers had a definite bearing in the development of the proper treatment of fevers, certain other of his therapeutic suggestions seemed absurd even at the time. He insisted that cobwebs made into ten-grain pills were more efficacious in the treatment of ague than bark, and at one time while in the West Indies, when the treatment with cobwebs from the dark cellars of the tropics seemed not to have the proper curative effect, he demanded that a supply of nice dry ones be sent him from England. Such recommendations, of course, did not escape the criticism of contemporary medical men, and even the caricaturists of his time took a sly dig at this idea, as may be seen in the frontispiece.

The usual hero stories are associated with his military career, and his biographers have of course endowed him with all the glamor of military valor. The account of his first enlistment reads like a romance. Suddenly tiring of his work in Jamaica, and realizing that his country was at war with America, he decided to proceed to New York to enlist. He hurriedly embarked without properly complying with the customs regulations, and after sailing the captain discovered that his passport was not properly certified, so Jackson was put ashore at the extreme



end of the island. Without money, his chance of reaching New York seemed hopeless, but he remembered that there was a small vessel at Lucca on the opposite side of the island, ready to sail for New York, and his only alternative was to walk to Lucca. This feat had never been attempted by a white man, and there was a tradition among the natives that no white man could accomplish it. Nevertheless, after completing the necessary formalities at Kingston, Jackson started to make the trip. Buoyant in spirit, he traveled so rapidly that he overexerted himself, and in the middle of his journey, after drinking a quantity of lemonade was seized with cholera morbus which was almost fatal but after five or six days rest he was able to proceed, and finally reached Lucca where he obtained a berth on the boat for New York. This incident was undoubtedly the foundation for his many subsequent warnings against overindulgence in food and drink while traveling.

When he reached New York he was practically destitute, and attempts to find professional employment either in the military or naval hospitals were futile, so he determined to enlist as a volunteer in the line. Even here he met with great difficulty, but with the influence of a friend whom he had met on his trip from Jamaica, he endeavored to join the New York volunteers, a provincial company. There was some delay in his enlistment, and meanwhile his financial condition forced him to make other efforts, so he presented himself to Lieutenant Colonel Campbell, of the Frazer Highlanders, and the colonel, finding that he had had medical experience, suggested that he join as an ensign and take an assignment as hospital mate. Soon after this, his Jamaican friend notified him that his commission in the New York volunteers was available, but Jackson was already satisfied with his assignment in the 71st Regiment, and this determined his career as a medical rather than as a line officer.

During the campaign in Virginia he was taken prisoner by General Morgan. The story goes that when General Tarleton, commander of the forces, had his horse shot from under him and was about to be taken prisoner, Jackson rushed up, yielded his horse to his general, and then under a flag of truce surrendered to General Morgan, and after being taken to the rear begged to be allowed to assume care of the British wounded. His offer was accepted. The next morning, during an interview with General Washington, Dr. Jackson offered to aid in caring for the American wounded, which request was readily granted, and so pleased was Washington with the conduct of Jackson that soon afterwards, when an exchange of prisoners was arranged, Jackson was one of the first to be paroled.

Practically all that we as Americans have been taught in school

of the conduct of the British troops during the Revolution, concerns the atrocities of the hired Hessians; Jackson's conception of discipline and morale was not of this type at all, but indeed was far ahead of his time, as will be seen by the following quotations:

The heart must be warm with charity, the mind clear with knowledge, for no other class of men are more dexterous in probing the rotten part of the heart and in unmasking the weak mind of their superior officer than the common soldier.

The soldier who is consoled by words of friendship, as he lies feeble and dejected in a hospital bed, will be given courage to the arm when he is on the field again and restored to the vigour of health, which will enable him to conquer like a hero, or fall by the side of his officer and friend, with his wounds in front and face towards the enemy.

He was always opposed to the Prussian system of discipline which survived in the British Army until as late as 1846. It is, of course, impossible in the development of such a reform to give total credit to any one man, as the viewpoint changes as we are led to consider the efforts of different individuals in a thing which requires cumulative experience for perfection.

Flogging in the British Army was finally abolished in 1846, as the result of the death of a private named White of the 7th Hussars, who died after receiving one hundred and fifty lashes with a cat-o'-nine-tails, pursuant to a court-martial sentence. This is spoken of as the Hounslow incident. Thomas Wakley, editor of *The Lancet*, was at the time coroner of Middlesex. Always ready to make a record, Wakley seized upon this incident and developed it into a *cause célèbre*. The editor and coroner was also a Member of Parliament and so could actively forward the investigation instituted in the House of Commons. All this attracted such interest that public opinion vetoed the practice of flogging in the army from this time on, although it was not until the act of 1881 that it was formally abolished.

Seriggs, in his "Life of Thomas Wakley," gives entire credit to him in bringing about this change in discipline in the British Army. On the other hand, Dr. John Brown in his essay on Dr. Henry Marshall fails to mention Wakley, and gives the credit to Dr. Marshall and Dr. Ferguson, who were aided by pertinent articles on this subject in the *London Times*; but forty years before, Robert Jackson had said, and he continued to repeat both by precept and example all these years: "There is not one instance in a thousand that a cat-o'-nine-tails has made a soldier what he ought to be."

Even while eulogizing Marshall in this connection, Jackson is quoted by Dr. Brown, as among the men who had been medical military worthies as follows: "R. Jackson, whose 'System and Arrangement of the Dis-

cipline of the Medical Department of the Army' is most valuable and judicious, and far in advance of his date" (1805).

Brown here quotes "Discipline of the Medical Department of the Army," but Jackson by no means limited his observations and recommendations to the Medical Department. In 1804 he published "A Systematic View of the Formation, Discipline and Economy of Armies," of which there was a second edition in 1824 and a third in 1845. This book displays a wide knowledge of military affairs in general and even today is of great interest. From a historical standpoint, Jackson goes back to the military affairs of the Spartans and in turn considers the predominating traits of the various nations successful in war, down even to his own date. From his own individual observations he gives what would now be considered an accurate sociological survey of the classes from which the armies were recruited, and he adds to this a careful analysis of the methods of drill and discipline in these different countries. He even adds comments on the ability of the commanding officers with whom he had been thrown more or less directly in contact. His estimate of these officers is remarkably well balanced and, even today, fits in much more accurately with the consensus of historical opinion than the usual expression of his prejudiced times. Even while Napoleon was considered throughout England the ogre of Corsica Jackson speaks of him so:

Napoleon, who was a man of genius—imposing and imperious, not wise and not candid—appears to have had a systematic head. He was active, indefatigable in labor, and working on principles of science which the early periods of the Revolution had brought to light, he organized the Empire of France in all its departments on a systematic basis, and did so with a skill and precision which proved that, while a man of wide scope in design, he was also a superior energy in execution.

His analysis of the American Army as he saw it during the Revolution rather surprises those of us who have received our information from the popular histories, but certainly confirms Mr. Owen Wister in the analysis of this situation which he gave us at the time of our entrance into the World War.

These two books were written after Jackson's forced retirement from the army, but before the Parliamentary Inquiries into the state of army affairs, and these books must have been consulted quite frequently by those who were instrumental in presenting the case before the committee of investigation.

The climax of Dr. Jackson's military career was his quarrel with Mr. Thomas Keate, Surgeon General, and Sir Lucas Pepys, Physician General, which had a very important bearing upon the medical reorganization of the British Army and which is a story in itself.

After Hunter's death the Army Medical Department was reorganized, and Mr. Thomas Keate, who had been prominent in the opposition to Hunter in the St. Bartholomew Hospital controversy, was made Surgeon General, and Sir Lucas Pepys, Physician General. Immediately following this change, much of Hunter's good organization, founded on his own personal experience of the necessity of real worth and military training, was torn down and reconstructed so that the Army Medical Service was more or less dependent upon the whims, fancies and prejudices of the Royal Colleges. The separation of medicine and surgery so deplored by Albutt in his St. Louis address was never more pronounced than at this period, and since the Royal Colleges claimed equal rank, the Army Medical Department was organized with a Surgeon General, a Physician General, and an Inspector General of Hospitals, constituting a board in control of army medical affairs.

Scriggs in his "Life of Thomas Wakley" clearly describes the general condition of medical practice in London at a time slightly subsequent to this period, but while the Royal Colleges dominated the Army Medical Department and controlled all civil appointments of importance not only in London but throughout England.

Early in 1793 Hunter had promised Jackson an appointment as army physician, but Hunter's rule had been that a previous service as regimental surgeon was requisite before such an appointment could be made, so Jackson accepted the minor appointment and was assigned to the "Buffs," expecting to be sent to the West Indies, but instead the regiment was made a part of the expedition against Cherbourg, which was a complete failure, as the troops did not even land in France.

In a personal interview in March, 1794, after Hunter's death, Jackson approached Sir Lucas Pepys for confirmation of his appointment as regimental physician, but Pepys insisted upon the regulation so recently adopted and rebuffed Jackson with the statement: "Had you the knowledge of a Sydenham or a Radcliffe, your request could not be granted: you are a surgeon, and the surgeon of a regiment can never be allowed to be physician to His Majesty's Army." Although Jackson was quite willing under the circumstances to resign, his regiment was on the point of embarkation for Flanders, and, anxious to see real service upon a large scale, he pocketed his pride and remained in the service, but this circumstance probably started the feud which terminated later in his attack on the organization of the Army Medical Service.

While in Flanders, Jackson met a comrade of the American campaign, Major Calvert, afterwards Sir Henry Calvert, Adjutant General to the British Forces. Through this chance meeting, Jackson was brought in contact with the Duke of York, Commander-in-Chief, and made

such a favorable impression that the duke was ever afterwards a staunch friend and strong partisan. This is at least one instance where the efforts and intervention of Mrs. Mary Ann Clarke were not needed.

The campaign in Flanders was disastrous from a health standpoint, and the army physicians were so inefficient that the mortality was enormous.

General Harcourt, who had been left in command on the Continent when the Duke of York returned to England, appointed Jackson as Physician to the Forces, and, much to the chagrin of the Army Medical Board, the duke approved the recommendation and insisted that the Medical Board confirm the appointment.

In this rank, Jackson had charge of the embarkation of the sick at Bremen, and while so employed, Dr. Kennedy, Inspector General of Hospitals, died and Jackson was promoted to his position, which in fact made him senior medical officer of the forces on the Continent, but his official communications to the Medical Board in London remained unanswered.

When the troops were finally returned to England, Dr. Jackson was ordered home. Almost immediately an opportunity was offered him for service in his favorite field, the West Indies. Jackson felt that he was entitled by experience and service to be chief medical officer of the expedition, and such duty was originally assigned to him, but in some way the offer as made injured his pride, and he declined the appointment. Later, however, he accepted an assignment as second in command. This perhaps was fortunate, as it gave Dr. Jackson opportunity to visit and inspect all the military hospitals in the West Indies and there study intensively the various fevers in which he was so much interested.

From 1794 to 1796 his advancement in rank had been rapid. He undoubtedly was competent and efficient, but his promotion had not been upon the initiative of his superior officers in the Medical Department, but was forced by the Duke of York. In fact, Jackson seems to have been the center of a controversy such as has been known in other times and in other armies between the line and the staff.

In 1798 the forces in the West Indies were reduced, and Jackson took the opportunity to return to England. In company with Dr. Borland, he then visited America, spending some time with Dr. Benjamin Rush in Philadelphia. His "*Fevers of Jamaica*" (London, 1791) had been republished in Philadelphia, 1795, and Jackson was pleased to find it "considered a standard work and in the hands of every respectable practitioner." This pleasant trip, with the formation of so many friendships in America, was the lull which preceded the storm.

Soon after returning to England, Jackson was placed in charge of

the Russian sick which had returned from the Continent with the English forces. In 1800 the Duke of York nominated him Physician and Head of the Army Depot Hospital at Chatham, the scene of so many of Samuel Pepys' pleasant junketing trips.

A slight digression might be sanctioned here, to mention one of the factors of great importance in Jackson's career. Almost immediately upon assuming the duties of hospital mate in New York in 1778 he arranged for a form of commutation of rations for the sick, in that he took the daily allowance per soldier in kind or in money and expended it for proper hospital diet. It is spoken of throughout his career as the change from salt to fresh rations. It worked so well in a small way in this early assignment that it was instituted in all the hospitals in his charge subsequently, so far as might be. Of course this aroused opposition among the contractors and profiteers who furnished supplies to the army, in that it was such a direct saving along all lines. In fact, in a royal warrant in 1806 adopting this plan of Dr. Jackson, it is calculated that it saved eighty thousand pounds per year on the colonial contract alone.

Unfortunately, a severe epidemic with a high mortality visited the hospital at Chatham in 1801, and this offered Keate and Pepys the long-looked-for opportunity. They preferred charges against Jackson sufficiently pertinent to necessitate a board of inquiry, which was ordered by the Commander-in-Chief. The findings of the board were on the whole favorable to Jackson, but he felt that his exoneration was not complete, so he resigned and was retired on half pay. Jackson always thought that the contractors, disgruntled at his commutation arrangement, had an influence in this verdict.

Dr. Jackson then took up private practice at Stockton-on-Tees and began a very active literary career. From 1803 to 1809 his bibliography contains nine items, and in addition there were numerous protests and arraignments of the Army Medical Department, addressed to the home government.

Jackson claimed that it was only when Mr. Pitt "did not deign to acknowledge his communication even by one of his undersecretaries that recourse was had to the hands of a printer." In other words, he now grasped the time-honored prerogative of the native Britisher and became a "pamphleteer," addressing his activities to Mr. Thomas Keate and Sir Lucas Pepys in a series of pointed pamphlets.

While Dr. Jackson's resignation from the army was entirely voluntary, his enemies contrived to spread the impression that it was forced, and that he was unfit to perform the duties of army physician. Jackson met this situation by publishing, in 1803, "Remarks on the Constitution

of the Medical Department of the British Army," and in 1805 he published "A System for the Arrangement and Discipline of the Medical Department of the Army."

In 1808 Parliament had appointed a commission to inquire into the conduct of the various departments of the army, and in so doing did not neglect the Medical Department. In the course of their investigation this commission must have seen and studied Jackson's books and pamphlets, since in the celebrated Fifth Medical Report, which came out in 1808, changes were suggested directly in line with the recommendations which Jackson had offered in his various contributions.

The Fifth Medical Report created consternation in the minds of the Physician General and the Surgeon General, and Mr. Keate published his "Observations upon the Parliamentary Report" in which he attacked Jackson's character. Jackson then made request for a public investigation before a military court, which request was refused by the Judge Advocate General upon the technical ground that Jackson was retired upon half pay and could not make such a demand. Jackson met this situation by writing open letters to Keate, which were far from being politic or diplomatic; in fact his accusations were vitriolic in character.

This was just at the beginning of the Peninsular campaign, when things in Spain were so serious that everyone was anxious to get into the service. Dr. Jackson intimated to the Duke of York that his services were at his disposal, regardless of any rank to which he might be assigned. The duke referred this offer to the Army Medical Board, which practically consisted of Keate and Pepys, and they informed the duke that there were insurmountable objections to Jackson being employed in any capacity in the Medical Department. The controversy then waged furiously again, mainly concerning Dr. Jackson's medical diploma, the board contending that he did not have a diploma, and Jackson offering proof that it had been lost in the campaign on the Continent in 1794, and stating that a certified copy could be obtained from the University at Leyden. The board further brought up the Chatham incident of 1801 and questioned Jackson's practice and method of treating the sick.

As a sample of Jackson's open communications in the controversy, the following aspersion on Sir Lucas Pepys, Physician General and the court favorite, may be of interest:

If my doctrines and practices be erroneous, it is time that they should be publicly proscribed; but it would be unfair, and it might be injurious, to proscribe them on the bare assertion of the president of the college, who never saw me treat a single case of disease, and who appears himself never to have treated a patient of the class upon which my practice was tried. The illness of the soldier and those of the ladies

of the court are often of a different character; and I am aware that any man of common sense may conceive it, that means which seem harsh, and which might be even dangerous on the delicate conditions of those persons who ordinarily fall under Sir Lucas' care, though powerful in effect, are perfectly safe as applied to violent diseases in the more robust subjects with whom I have been chiefly concerned.

History records many interesting disputes between prominent medical men. Foote made an unfortunate attempt to besmirch the honor of Hunter, a genius already dead. Bidloo made a direct charge of plagiarism against Cowper, of which, for the time being, there was absolutely no defense, but in his later elephant folio Cowper succeeded in demonstrating that he did have a proper knowledge of anatomy and art. The Blondell-Turner dispute was a battle of words at long range, and the Sharpe-Pattison a fight with the same words, but at less distance. The Abernathy-Wakley trial was a marvelous exhibition of polemics in a court of equity, but the Jackson-Keate controversy finally led to a direct personal assault.

Soon after the exchange of pamphlets, Jackson, incensed at his humiliation, met Keate upon the street, and after a stormy interview he struck his superior officer across the shoulders with a cane. A court-martial, of course, followed. Jackson technically had no defense, and he was sentenced to six months' imprisonment.

The pamphleteering between Jackson and Keate had attracted considerable attention, and in his imprisonment he was not without his friends. Following the parliamentary investigation which resulted in the Fifth Medical Report, the very next year, 1809, Colonel Wardle's charges against the Duke of York and Mrs. Mary Ann Clarke were presented in the House of Commons. The case was bitterly fought and attracted great attention, and while in the final report the duke was seemingly vindicated, nevertheless he was forced to resign as Commander-in-Chief.

In 1810 occurred the disastrous Waleheren Expedition which caused another parliamentary investigation. In the report of this investigation, the Medical Department of the Army, and particularly Sir Lucas Pepys, was severely censured. The effect of this series of parliamentary activities was to bring about a fundamental reorganization of the British Army. In this reorganization, the changes in the administration of the medical department were practically along the lines that had been laid down by Dr. Jackson. The tripartite board ceased to exist, and the entire Medical Department was put directly under the charge of a Director General with three principal assistants, so that finally Robert Jackson was vindicated and his plan of arrangement adopted. The



attitude of the British public to the result of the controversy may be seen through the eyes of the caricaturist in the frontispiece.

This vindication completely outweighed the court-martial sentence and reestablished Jackson in the estimation of the new military authorities, so he was able to return to military duty in 1811, with a pleasant assignment which required him to visit again the West Indies and enabled him to continue his first hand study of fevers, and when he returned to England in 1815, at the end of his military service, he published "*A Sketch of the History and Cure of Febrile Diseases, more particularly as they appear in the West Indies, among the Soldiers of the British Army.*"

Jackson's military career was practically coextensive with the Napoleonic wars, but, save for the brief campaign in Flanders in 1794, he was not brought into direct contact with the main events of this era. He was on a friendly footing with the Duke of York, but had no such standing as had Larrey and Corvisart with Napoleon. Jackson is not remembered as a hero or a genius, as are M'Grigor and Larrey, but nevertheless, in the quietude of the outposts, he had time to study and analyze the conditions of medical military service and make suggestions concerning discipline, training and morale which were at least a century ahead of his time.

#### BIBLIOGRAPHY

"*A Treatise on the Fevers of Jamaica: with Some Observations on the Intermittent Fevers of America: and an appendix, containing some Hints on the Means of Preserving the Health of Soldiers in Hot Climates,*" London, 1791. 8vo.

The Same, Philadelphia, 1795.

"*The Outline of the History and Cure of Fever, Epidemic and Contagious: more especially of Jails, Ships, Hospitals, etc., and the Yellow Fever. With Observations on Military Discipline and Economy, and a Scheme of Medical Arrangement for Armies.*" Edinburgh, 1798. 8vo.

"*Remarks on the Constitution of the Medical Department of the British Army, with a Detail of Hospital Management: and an appendix, attempting to explain the Action and Causes of Producing Fever, and the Operation of Remedies Effecting a Cure.*" London, 1803. 8vo.

"*A Letter to the Editor of the Edinburgh Review.*" London, 1804. 8vo.

"*A Systematic View of the Formation, Discipline and Economy of Armies.*" Stockton-on-Tees, 1804. 4to.

"*A System of Arrangement and Discipline for the Medical Department of Armies.*" London, 1805. 8vo.

"*An Exposition of the Practice of Affusing Cold Water on the Surface of the Body for the Cure of Fever: to which are added Remarks on the Effects of Cold Drink: and of Gestation in the open air, in certain conditions of Disease.*" Edinburgh, 1808. 8vo.

"*A Letter to Mr. Keate, Surgeon-General of the Army.*" London, 1808. 8vo.

"*Letter to the Commissioners of Military Inquiry, explaining the True Constitution of a Medical Staff, the Best Form of Medical Economy for Hospitals: with a*

Refutation of Errors and Misrepresentations Contained in a Letter by Dr. Bancroft, Army-Physician." London, 1808. 8vo.

"Second Letter to the Commissioners of Military Inquiry Containing a Refutation of Some Statements Made by Mr. Keate." London, 1808. 8vo.

"Letter to Sir David Dundas, Commander-in-Chief of the Forces." London, 1809. 8vo.

"Sketch of the History and Cure of Febrile Diseases, More Particularly as They Appear in the West Indies among the Soldiers of the British Army." 1817.

The Same, 1820, 2 vols. 8vo.

"A View of the Formation, Discipline, and Economy of Armies: with an Appendix, containing Hints for Medical Arrangement in Actual War." Stockton, 1824. 8vo, second edition.

The Same, 1845. Third edition, with the Life of Jackson.

"Observations on Yellow Fever in Spain." 1821.

"An Outline of Hints for the Political Organization and Moral Training of the Human Race." 1823. 8vo.

#### ROBERT JACKSON

For Biography, see *Edinb. M. & S. J.*, 1828, xxix, 110-118 (J. B.) (James Borland); also *Tr. Prov. M. & S. Assn.*, London, 1835, iii, 405-431 (Thos. Burns); also Preface to the 1845 edition of "Systematic View," etc.; also *Gentleman's Magazine*, June, 1827, p. 566.



## AN EPISODE OF THE SECOND BATTLE OF BULL RUN

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LATELY, among some papers relating to the Civil War, I came across a list of the contents of a train of thirty-six wagons full of medical supplies which I took out to Centreville at the time of the "Glorious Victory" of the Second Bull Run, as Pope had proclaimed it. It awakened a flood of long silent memories of the days of almost sixty years ago, when, alas, brothers North and South faced each other in battle array! Now, thank God, we have been united by common sacrifices in the Spanish and the Great World wars. Our hallowed dead lie peacefully side by side "in Flanders Field" and in the soil of France. Never hereafter can we be put asunder!

The first two wagons are omitted from the list as they held my own impedimenta and those of the 36 drivers and of the escort of soldiers who guarded us from attack from without and fright from within—both of which were quickly realized. Here is the "Packer's List" from Wagon 3 to Wagon 36. I reproduce the spelling of the packer. The italics and phrases in parentheses are my own.

- Wagon No. 3 contained *whiskey*.
- Wagon No. 4 contained *whiskey*.
- Wagon No. 5 contained *whiskey*.
- Wagon No. 6 contained *whiskey*.
- Wagon No. 7 contained *whiskey* and concentrated essence of beef.
- Wagon No. 8 contained essence of beef.
- Wagon No. 10 contained 4 boxes of tea, 3 boxes of arrow root, 2 boxes cocoa, 1 box simple cerate (for dressing of wounds), and 1 box of towels.
- Wagon No. 11 contained *whiskey*.
- Wagon No. 12 contained *whiskey* and *brandy*.
- Wagon No. 13 contained 2 boxes pulv. lini. (powdered flaxseed), 1 box ferri per-sulphat (a preparation of iron), 1 box morphin and 2 boxes farina and essence of beef.
- Wagon No. 14 contained *brandy*.
- Wagon No. 15 contained essence of beef.
- Wagon No. 16 contained *Port wine* and *whiskey*.
- Wagon No. 19 contained 2 boxes of hospital suits.
- Wagon No. 20 contained *Sherry wine*.
- Wagon No. 21 contained 4 boxes hospital suits.
- Wagon No. 23 contained *Sherry wine*, *whiskey* and soup and bouillè.
- Wagon No. 24 contained 1 box with field cases, muslin and sponges, 1 box hospital suits, 6 boxes tinct. opii, 2 boxes bandages, 1 box chloroform, and 1 box (adhesive plaster).

Wagon No. 25 contained 1 box of donations (some of these may have been "suspect"), 1 box of ether, 11 boxes soup and bouillè, and 2 pkgs. oakum.

Wagon No. 26 contained 20 litters and bed comforts.

Wagon No. 27 contained comforts.

Wagon No. 28 contained comforts and pillows.

Wagon No. 29 contained 3 bales blankets.

Wagon No. 30 contained 1 box with pocket sets (of instruments), surgeon's silk and needles, white wax and field tourniquets and 3 bales of blankets.

Wagons No. 31 and 32 contained each, two bales of blankets.

Wagon No. 33 contained 1 bale of blankets and 1 box of sugar (200 lbs.)

Wagon No. 34 contained 2 bales of blankets.

Wagon No. 35 contained 2 bales of blankets, 3 boxes barley and 1 box isinglass plaster.

Wagon No. 36 contained 2 bales of blankets.

The Eighteenth Amendment to the Constitution was evidently a faraway event.

To relieve the anxiety of any friends who may happen to read these lines, as to my personal habits, "may I not" disclaim any responsibility for being at the head of what might be called a "traveling saloon?"

The story of our short Anabasis of about 40 miles from Alexandria to Centreville, Va., near the battlefield of both the First and the Second Bull Run, our return to Washington, and the fate of these supplies, follows.

For some time I had been stationed at the Ascension General Hospital in Washington. On August 30, 1862, the second and last day of the Second Battle of Bull Run, I received an order from Medical Director John Campbell, in Washington, to "proceed to the battlefield near Manassas and render such services as may be required of you (me) and to return with the wounded who will be brought here."

Accordingly, I started at once, as the aforesaid train of thirty-six wagons was all ready. We left with cheerful hearts to greet the victorious army and to minister to the sick and wounded.

Our thirty-six drivers were "contrabands," to use the picturesque legal name given by General Butler to the escaped negroes from the southern states.

En route, near Fairfax Court House, about half-way to Centreville, we were fired upon by a Confederate battery on a parallel road, possibly half a mile or more away. I thought it passing strange, after such a "victory," that the Confederates should appear between our army and the City of Washington. We suspected that all had not gone well

with Pope's army, but only learned the true condition on arrival at Centreville.

I had, however, too acutely serious business on hand with my teamsters to allow any time for speculation. The drivers were very anxious to get much farther away from such an active source of danger and were about to desert *en masse*! It took, however, only a brief time of sober second thought for them to decide quickly that my pistol and the guards' rifles were apt to be much more deadly at short range than the artillery of those days at such a comparatively long range.

En route, Gen. Phil. Kearney, with a squadron of cavalry, passed us at a gallop. Ten minutes later he fell in with the enemy and was mortally wounded.

On arrival at Centreville I found that every man who had good legs, unless too severely wounded above them, had bolted, as he was unwilling to be captured. Our guard, too, hastened back to Washington with all speed to escape capture.

In Centreville, the little church was crowded full of badly wounded soldiers. There was no surgeon to care for them, as all the surgeons also had accompanied Pope's defeated army. I had, of course, a plain duty before me—to care for our wounded. I had no orderlies, no nurses, no medicines, and no supplies except what I had brought with me. There were five or six Christian Commission and Sanitary Commission men who had stayed by this churchful of utterly disabled men, not a few of whom had had a limb amputated. We could not forage. It was all we could do to cook, feed, dress and care for the wounded. We worked twelve to fifteen hours or more a day.

To prevent depredation, I had immediately stored all my supplies in a smoke-house. A day or two later, the Sixth Virginia Cavalry, commanded by Colonel Flournoy, came in. No one could have behaved in a more gentlemanly manner than they. Of course they paroled all the wounded, to be used in the exchange of prisoners, though nearly, if not more than half of them, I judge, would be dead by the time their names figured on the exchange lists.

At the beginning of the war, medical officers were treated as prisoners of war, but by the time of the Second Bull Run, sixteen months later, their non-combatant status was recognized. I was in no way molested, but was just as free to carry on my surgical work as before their arrival.

Naturally, they demanded the keys of the smoke-house. On entering, the colonel and one of the chief surgeons of Lee's army gazed on the labels with watery mouths, as everywhere they saw Whiskey, Brandy, Sherry, and Port, besides such useful but less stimulating things as bouillon, blankets, and a dozen cases of fine surgical instruments, etc.

One of them turned to the other and said with an explosive preface: ". . . there is more good liquor in this little smoke-house than in the whole city of Richmond!" and I fancy that he knew whereof he spoke!

In our surgical practice, at that date, we used alcohol in its various forms most freely, as may be judged by the amount I carried to Centre-ville. In blood poisoning we used it lavishly. An interesting side light is thrown upon the surgical practice of those days in Kinglake's "Crimean War" (vol. vii, pp. 362-3).

Miss Stanley (the sister of Dean Stanley of Westminster Abbey) and forty-six nurses preceded Florence Nightingale to the English Army. When they asked "What do you wish us to do?" the surgeons practically said to them that "the dressing of surgical cases would be done as heretofore," but the nurses were asked to "give them all that watchful care which alleviates suffering and tends to restore health and strength. When you see us directing that *stimulants in large quantities* are to be administered to a patient, you will know that his case is *all but hopeless*, and that, if he be saved, he will owe his life to the constancy with which you watch over him and keep him supplied with nourishment."

Now we manage far better. By the labors of Pasteur and Lister and others, we have learned how to *prevent* blood poisoning. Practically blood poisoning *has disappeared*, with the exception of those cases which reach competent surgical aid too late to combat the infection which is its cause.

I asked for the loan of the operating case I was using. This the colonel very politely granted, but with the proviso (a very proper one) that whenever I left I should return it to the Confederates, which I did.

Soup or bouillon (which the packer calls "bouillè") was about the only thing that was canned in '62. They gave me a very liberal supply. It was practically almost the only food we had for our wounded. The neighbors were very sullen and brought us nothing for sale, so far as I remember. Even the thin layer of straw on which the men lay—and on which so many died—we could not replace for want of anyone to forage for us. Daily, some of this thin layer was soiled by the abundant "pus" and had to be lessened till finally these poor fellows lay on bare boards. Horrible bed sores as big as one's hand quickly developed. Secondary hemorrhage, following the necessarily hasty operations in a defeated and retreating army, occurred almost daily. Sometimes it came in such a flood from the femoral artery that the poor fellow died in a few minutes, and I said, "Thank God!" for by no possibility could he recover and every hour of life merely prolonged his misery.

The third day after the battle, I passed such a night as I had never before nor ever since experienced in a long life. After an exhausting

day's work, I got to bed at midnight. At about 3 a.m. I was awakened because a long train of ambulances, carrying our wounded from the field of battle back to Washington, had arrived. Fifty poor, thirsty fellows were crying for water; fifty more were crying with the pain from a jolting ride of 9 miles over a corduroy road. Most of them had had nothing to eat for one, two or three days, save what they had obtained from their own haversacks or those of poor fellows lying dead in their neighborhood. Some had such horrible wounds that they could absolutely go no farther and had to be taken at once into the hospital.

One of us immediately started with a pail of water and a tin dipper to supply the first want of all; another, as quickly as we could heat some soup, started on a similar errand to supply their hunger; while I took a bottle of morphin and my pocket knife and did not worry over any superfluous exactitude in doling out the blessed relief which morphin alone brings to men in pain. All of this was done in total darkness, save for two or three dim lanterns, in a drizzling rain, and in 6 inches of Virginia mud.

On September 5, fortunately, a train of ambulances arrived and carried back to Washington myself and the patients who were still alive. There they had all the surgical care which was available in that pre-antiseptic and pre-bacteriological day.

But what dreadful results followed our best treatment in those days! Tetanus killed almost 90 per cent of the victims, and blood poisoning (both now practically banished) killed 97.4 per cent. Hospital gangrene—what fierce irony in the very name!—was frequent and had a mortality rate of 45.6 per cent. Since the Civil War, I have never seen another case. To explain what it was to my students at the Jefferson Medical College, I had to rely on the pictures in the Medical and Surgical History of the War.

During the entire Civil War, recovery after a wound of the small intestine occurred in only one single case! Today, if seen early, recovery almost always follows operation. As many as *nineteen wounds* of the small intestine, in a case of gunshot wound of the abdomen, have been closed and the patient recovered! No one who began the practice of surgery after, say, 1879, when Lister's antiseptic method began to come into general use, can form any idea of the enormous suffering and great mortality which followed surgical operations before that date. Even those who escaped with their lives suffered terribly from high fever and severe pain during a long convalescence.

The gift to humanity by Pasteur, Lister and Koch is simply incalculable. This I say deliberately and imperatively, because I lived through those times, and *know* what the actual, undeniable *facts* were.

## PULMONARY SYPHILIS WITH REPORT OF A CASE, AND REVIEW OF REPORTED CASES

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DURING the past few years a number of papers on pulmonary syphilis have appeared in various medical journals. Most of the writers have reported from one to several cases that they have had under observation; some of the authors, judging from their own experience, and others, judging from a review of the medical literature on the subject, have stated that pulmonary lues, although not common, is not the extremely rare disease that it has been supposed to be. All have agreed that the therapeutic results in uncomplicated cases are excellent. No less an authority than Virchow (1) made the statement years ago "that some patients die of so-called pulmonary tuberculosis for lack of antisiphilitic treatment." Why is it, then, that clinical syphilis of the lung is scarcely ever considered in the diagnosis of puzzling cases of lung involvement? The impossibility of definitely ruling out tuberculosis and also of proving that the case is one of syphilis is of course the important reason, but active tuberculosis of the lung is diagnosed in the absence of tubercle bacilli in the sputum. In fact, a most important object of the anti-tuberculosis campaign of the past few years has been to emphasize the importance of making a diagnosis before the appearance of the tubercle bacilli, in order to insure the patient proper treatment in time. It should not be necessary to wait for an autopsy to make a diagnosis of pulmonary lues when there is presumptive evidence that the process may be of this nature, particularly when proper treatment will yield such good results. Untreated cases have an extremely bad prognosis, so it can be seen what a serious mistake it is to overlook a case.

Syphilis of the lung results from an untreated or insufficiently treated case of ordinary lues. Working from this as a clue, the history of many of these cases will clear up a most puzzling case if certain points of difference between a tuberculous and a syphilitic pulmonary process are kept in mind; at other times, however, the only evidence will be a history of infection or a positive Wassermann, with the absence of tubercle bacilli in the sputum after repeated examinations.

*Pathology.*—In considering the pathology of syphilis of the lung, a distinction must be drawn between that due to hereditary lues and an infection following acquired syphilis. The former is a not infrequent condition seen in infancy and childhood. Following acquired syphilis, several varieties of lesions have been described in the lungs, but in



general these may be classified under three heads: First, gumma; second, cellular infiltration which may lead to fibroid changes in the bronchi alveolar walls and blood vessels; third, focal—an area in the lung may become consolidated or show catarrhal conditions. Stanley (2) states that real syphilitic pneumonia has been described. All these forms are most frequently seen in the hilus and in the lower lobes, but may attack any part of the lung.

The end results of these forms may be a contracted, misshapen lung of iron-gray color, thick end, adherent pleura, bronchiectatic dilatations, and in other cases especially when gummata are present and have run a progressive course, destruction of lung tissue with cavity formation. Other conditions that may be seen are pleural effusion particularly in advanced stages, gangrene, changes in the blood-vessel walls, and stenosis of bronchi. A favorite site is at the branching of the bronchi.

Points of importance in distinguishing between a tubercle and a gumma are as follows. It is frequently possible to pick out and break up caseous masses in the tubercle and, moreover, calcification is frequently seen, but both these processes are rare in the gumma; when calcification does occur it is slow in development. In the syphilitic lesion it is frequently possible to recognize the original lung structure, but in the tuberculous lesion this is lost early. In the tuberculous nodules anthracosis is more noticeable than in the syphilitic nodules; the gumma has a wider outer zone than the tubercle and also shows blood vessels. These are rare or absent in the tubercle. Giant cells are rare in syphilis and common in the tuberculous process, but plasma cells are more common in the round cell zone of the gumma than in the tubercle. Occurrence of a lesion in only one lung is more in favor of syphilis than tuberculosis.

Aneurism of the smaller blood vessels of the lung so common in tuberculosis is rare in syphilis. Another point of interest is that the cell count and globulin content of the spinal fluid may be of considerable help in diagnosing a luetic lesion, as may also the presence of lymphocytosis.

Carrera (3) states that it is possible that the lungs are not exempt from involvement in the mild inflammatory process caused by lues in other organs, and this may lead to fibrosis of the lungs. Cornil mentions that syphilis causes an increase in the endothelial cells of the lymph glands of the lungs, later resulting in caseation. Contrary to the opinion of many observers, there are some who believe that syphilis affects tuberculosis favorably by preventing spreading and favoring healing, due to the fact that the former disease stimulates formation of connective tissue.

Pottenger (4), in a comparison of the two diseases, calls attention to the fact that the portal of entry of the tubercle bacillus is concealed, while that of the *spirochaeta pallida* is an abraded surface and nearly always evident. After entering the body the spirochaetes develop more rapidly than the tubercle bacilli and in two to three months are scattered over the whole body. Years after the tubercle bacilli have entered the host, the disease process may still be localized. Both diseases are primarily lymphatic diseases and attack these structures early. Spirochaetes are more often found in the blood than the tubercle bacilli, and blood-vessels are more often attacked by lues. Infection of many body structures at the same time are common in lues, rare in tuberculosis. The spirochaetes are not so adversely affected by the lymph elements as the tubercle bacilli. Both may affect the nervous system through toxins.

A condition that, strictly speaking, should be considered under syphilis of the circulatory system may be mentioned here, and that is the tendency to sclerosis of the pulmonary artery and branches. This may be most extensive and results in a remarkable combination of symptoms the most characteristic of which are myocardial insufficiency with hypertrophy and dilatation of the right heart. Warthin (5) has pointed out the resemblance of this condition to Ayerza's disease or *cardiacos negros*.

*Symptomatology.*—The difficulty of making a positive diagnosis of syphilis of the lung is well recognized. Strumpell (6) says no definite clinical description can be made. The ubiquitous tubercle bacillus renders it impossible to rule out of consideration a tuberculous process; moreover, the syphilitic seems to be predisposed to tuberculosis, as shown by Christian's (7) experiment. He inoculated two guinea-pigs with blood of syphilitics in the secondary stage, then injected them with tubercle bacilli, with the result that they died more quickly than the controls. Streffed has observed that the longer the interval after the chancre the milder the tuberculosis when it develops, but when tuberculosis is added to a recent syphilitic infection the course is usually rapid. However, as Stanley, Chelmichi, (8) Lisser (9) and others have pointed out, there are certain signs and symptoms that, when present, justify the diagnosis of syphilis of the lung, or at least demand anti-luetic treatment as urgently as do certain symptoms and findings, treatment for tuberculosis before the appearance of the tubercle bacillus in the sputum.

These patients are usually around middle age and may give a history of having had a primary infection some years before. Many give a history of dyspnea usually dating back for some period of time. So common is this history that it is really of some significance, particularly

if it occurs in a patient who does not present the appearance of being especially ill. This shortness of breath may be present with or without exertion. At times it may partake of the character of an asthmatic attack. Chelmicki states that in his opinion this is due to the narrowing of the larger and smaller bronchi as well as the alveoli. This may be a real stenosis or due to an increase of connective tissue or to enlarged glands.

Cough, the result of a tracheal, laryngeal or bronchial irritation, usually occurs early and may be severe or slight, and at times spasmodic. The character of the sputum presents nothing of real significance aside from the presence of elastic tissue in case of tissue destruction. Tubercle bacilli are absent. A history of hemorrhage may be obtained, but this is not so likely to take place as in pulmonary tuberculosis. Another symptom may be loss in weight, but several reports speak of the remarkably healthy appearance of many of the patients considering the extent of the pulmonary lesion. Various reports indicate that a luetic lesion will not produce the same systemic results or have the same toxic effects as a tuberculous lesion of the same extent. Possibly Fournier's (10) observation may explain in part the difference in the early symptomatology of the two diseases. He states that mediastinal adenitis is almost always absent in early lues, but constant in tuberculosis; as a result the reflex action of the pneumogastric is not excited and the usual symptomatology of early tuberculosis is absent. The course is more slow and insidious than tuberculosis, and considerable destruction of tissue may take place before symptoms develop. It is well to question closely patients who deny having had lues.

Secondary invaders may complicate the clinical picture, and, if present, the symptoms are more likely to be marked, and the course more rapid.

The importance of a careful history, particularly in cases who deny venereal infection, cannot be overestimated. This is illustrated by a recent experience with a patient sent to the hospital for a cardiac disorder. After repeated statements to the effect that he had never been ill, he was finally asked if he had ever had eye trouble. He answered that over thirty years previously he had a small sore on his left lower eyelid which seemed to resist treatment for a few weeks, but then finally healed. On close examination a small scar was found on the margin of the eyelid which would have escaped detection except on careful examination. A Wassermann was four plus positive.

A systematic general examination is another important procedure to be observed. Small irregular areas of alopecia, rigid pupils, nasal infections, or lack of knee jerks are signs which the patient frequently

does not know the existence of, but which the physician will detect. In cases of impaired hearing it is important to ascertain the cause of the deafness. If the labyrinth is affected, it will lead at once to the suspicion that lues may be at the root of the trouble. In this connection Warthin's statement is of interest, namely, that, next to the heart and aorta, the testes are the most frequent site of infection. As far as the chest is concerned, lagging on the side involved, impaired expansion and the other signs of impaired function so frequently seen in a tuberculous condition will be found. A thorough inspection with the eye open for abnormalities will pay for itself abundantly.

Palpation and percussion may help to reveal the site of the lesion. Statistics show that the majority of lesions in pulmonary syphilis are located at the base of the lung and are more likely to be unilateral. Several writers have found the lesion in the middle lobe. In a few cases it has been found at the apices. However, any chronic case with negative sputum, with a definite lesion at the base of either lung, and particularly if the lung findings are unilateral, should be regarded with suspicion and further evidence of lues looked for. An impairment of the percussion note out of proportion to the auscultatory findings of fibrosis is of importance.

As regards auscultation, Stanley mentions the progressive weakening of breath sounds as an important sign found in three of his cases. Bronchial breathing and crepitant râles are found in pulmonary syphilis as well as in pulmonary tuberculosis. Chelmicki mentions bronchial breathing which may be mixed with fine and medium râles at times ringing in character. Just as in tuberculosis, cavity formation, pleurisy with or without effusion, bronchiectasis, empyema and pneumothorax may take place. These conditions can be recognized by the usual methods. The most common complication, according to Chelmicki, is involvement of the pleura. This may take the form of a dry pleurisy or, if wet, a serous, serofibrinous or seropurulent fluid may be present and later adhesions may form. Bronchiectasis is a condition which seems to be not at all infrequent in syphilis, and when we recollect the frequency of stenosis in lung lues, the occurrence of this condition is not at all to be wondered at.

The other complications of pulmonary tuberculosis due to secondary invaders may be seen in pulmonary lues also. Frieberg and Schmorl have both described a spirochæte in the sputum, but in neither case was it similar to the spirochæta pallida in all points of resemblance. As far as I know, the spirochæta pallida has not as yet been found in the sputum of a case of pulmonary lues. Spirochætes, different from that of syphilis, have been described occurring in lung gangrene. The

spirochaetes at times found in the buccal cavity also have to be taken into consideration, and still another type of spirochaete described by Castalleni (11) has been found in several cases of lung involvement.

Enlargement of the liver and spleen may take place as a result of the syphilitic process, but this may also occur following other types of infection, particularly suppurative processes, causing amyloid changes.

In an analysis of thirty-five available reported cases the following significant points were noted. As regards sex, fourteen were females and twenty-one males. The ages varied from twelve years to sixty-seven, but 80 per cent were thirty-five years of age or over, so it is readily seen that the condition is one of middle age or old age in contradistinction to tuberculosis, which is especially a disease of youth. As regards results, 54 per cent recovered and 46 per cent died. This is a rather high death rate, but is explained in part by the fact that, of the thirty-five cases, the diagnosis was made at the autopsy table in six and that several were suffering from complications as nephritis, aneurism, and heart involvement. In uncomplicated cases the results from anti-syphilitic treatment were excellent, in some that were followed by X-ray examinations the lesions were noticed to decrease from time to time until finally nothing could be seen to remain. In others, although recovery took place, shadows could still be seen to persist at the point of involvement.

Of the thirty-five, three stated they had no knowledge of primary or secondary lesions. Two of these were women. Hidden sores and mildness of infection may explain the ignorance of these patients. The interval elapsing between the infection and appearance of the pulmonary symptoms varied from one year to twenty-five years. The majority gave a history of having had the primary infection ten years or more previously. It should be recalled, however, that the secondaries may be accompanied by pronounced bronchial symptoms. Recently I had under my care a young man who presented himself with a well-developed secondary eruption. On physical examination, above and below the right clavicle could be heard well-defined crepitant râles. These persisted for about two weeks after anti-luetic treatment was begun. So characteristic were these râles that a diagnosis of incipient pulmonary tuberculosis would have been justified had not other factors rendered this diagnosis improbable and the possibility of localized catarrhal conditions occurring in the lungs with the secondaries been kept in mind. In only seven cases was the site of the initial chancre mentioned; in five this was specified as being genital. As regards past history, one patient gave a history of a lump on the parietal bone that was removed several years previously. Two gave a history of previous miscarriages;

one had a period of transient blindness; one, ulcer of pharynx; one, ulcer of uvula; two, perforation of septum; five, perforation of soft or hard palate. One had an unspecified nasal involvement.

The symptoms complained of at the first visit to the physician were varied, but five stand out prominently, namely, pain or discomfort in chest and at times elsewhere, as in the abdomen and back and arm; dyspnea, cough, loss in strength and loss in weight. Hemoptysis is a rather infrequent occurrence, being mentioned in only two cases as a prominent manifestation. Night sweats and chills are other uncommon complaints, each being mentioned only twice, but these symptoms may appear later in the disease.

As far as the sputum is concerned, there seems to be no characteristic appearance that would lead one to suspect an infection of the lungs or air-passages with the *spirochæta pallida*. As stated, no one to my knowledge has yet demonstrated this spirochæte, in the sputum, although several other varieties of spirochæte have been found.

On examination pallor is mentioned only four times, and only once is the statement made that the patient looks very ill, and as being cyanotic. In fact, twice the record speaks of patients as being well nourished and once each as being muscular and as looking well. The observations made by a number of students of this condition, that an extensive lesion of the lungs may not be associated with the appearance of ill health as far as inspection is concerned, is apparently borne out. As already mentioned, Fournier has advanced an explanation that seems to be satisfactory.

Just as in tuberclosis, there may be visibly impaired expansion, lagging, limitation of chest movements, abnormal conformation of the chest, and displaced apex beat.

In one case a testicular tumor was found; in another case an aneurism of the aorta was demonstrated. A gumma of the lip was present in one case, and in another periostitis of the left fibula and tibia was found; enlarged spleen was found in three cases, general glandular enlargement in one case, enlarged cervical glands twice and enlarged liver three times. Clubbed fingers, supposedly due to the chronic pulmonary condition, is mentioned once.

It is rather difficult to decide definitely from the clinical reports the most frequent site of the lesion. It is clear, however, that the lower lobes and the middle lobe are more frequently involved than the two upper lobes, and that there is a slight predilection for the right side. A point to be kept in mind is that a syphilitic perihepatitis may cause pain in the region of the right lower chest simulating a pleurisy, leading to an erroneous diagnosis of pulmonary involvement of the right side. As

far as the character of the râles are concerned, there is nothing characteristic of luetic involvement. Crepitant and subcrepitant râles, harsh breathing, prolonged expiration, coarse bubbling râles and squeaky inspiratory and expiratory râles are all mentioned.

As to the extent of involvement, there is every gradation from a small gummatous nodule to the involvement of a whole lung and part of the other lung, but it is evident that the spirochaetal infection is far more likely to be localized in one lobe or lung than is the tuberculous infection. In three cases the lesions were found in the hilus.

In ten cases pleurisy is mentioned as complicating the condition and, of these, four were accompanied by fluid. In no case is purulent fluid mentioned; where thoracentesis was performed, the fluid was found to be of a serofibrinous character. This coincides with Chelmicki's statement that pleurisy is the most common complication of pulmonary lues.

Other complications mentioned are scoliosis, curvature, hydrops abdominalis, hypertrophy of heart, aneurism arch of aorta, purulent bronchitis, and chronic parenchymatous nephritis, once each. Bilateral ulcer of tonsils, osteitis of the cranium and vicarious emphysema are also mentioned. In one case, a severe blow to the chest seemed to precipitate the onset of pulmonary symptoms. Puffy lids were noted in the case of chronic parenchymatous nephritis. One patient had tonsillitis previous to the onset of the pulmonary disorder and another chorea.

There is nothing characteristic about an X-ray picture that will give the diagnosis; but here again there are a few points of significance that, when combined with other findings, will be of help. Roentgenologists state that in syphilis the shadows do not bear a distinct relation to the bronchi, while in tuberculosis the shadows are peri-bronchial and show a definite relationship to some branch of the bronchial tree. A gumma throws, as a rule, a well-defined shadow, but has to be distinguished from a new growth. The location of the process in the lower lobes or in the middle lobe and its limitation to one side speaks in favor of lues. As already stated, the results of therapeutic measures have been followed with the X-ray and, in several, diminution and even total disappearance have been noted. Those interested in the X-ray examination of pulmonary syphilis will find Carman's (12) article of great interest.

*Diagnosis.*—Absence of the tubercle bacillus after repeated examinations in a patient complaining of pulmonary symptoms should throw the physician on his guard. A considerable number of parasites have been found to be the cause of disease processes in the lung that should be kept in mind, particularly when the cosmopolitan nature of the popu-

lation of this country is taken into consideration. The recent report by Mason (13) of a case of lung infection with the spirochaeta bronchialis of Castellani occurring in this country is of importance. This case was of particular interest because of the associated empyema, with the presence of spirochaetes in the pus. Castellani has found this infection to be not at all uncommon in the Italian army and described a chronic form at times lasting for years. Violle has described a somewhat similar condition under the name of hemorrhagic bronchitis-mycosiques, and Nolf (14) has published a report of eleven cases infected with a spirillum which he believed to be the cause of the pulmonary disturbances. These latter cases were also from Europe. Other types of spirochaetes have been described particularly in case of lung gangrene. A few reports seem to indicate that the spirillum of Vincent's angina may occur in the lung.

Pulmonary actinomycosis must be kept in mind. This condition occurs frequently enough to warrant a careful search of the sputum and pleural exudates for the ray fungus in cases of undetermined infections. I have seen one case of pulmonary actinomycosis with another physician in which the sulphur granules were found in the fluid removed from the chest. The lower lobes are the parts usually affected.

Nocardiosis and sporothricosis occasionally are seen. Here again, usually located in the lower lobes, the diagnosis is made by demonstrating the organism in the sputum or the fluid obtained by thoracentesis. Under the heading of aspergillosis have been described a number of moulds that have occasionally been found in the lung and that can be demonstrated microscopically in the sputum.

Another interesting disorder that has been studied by Gilchrist, Ormsby and others is blastomycosis. This organism shows a preference for the skin but may involve the lung, particularly as a part of a pyemic process. The organism can be found in the sputum or the lesions by appropriate methods.

Closely resembling blastomycosis is coccidioidal granuloma, a very rare parasite. In the lungs it closely simulates tuberculosis, but is usually associated with lesions elsewhere, especially involvements of the skin.

Mendelson (15) has recently published an article under the heading of "Tropical Broncho-pulmonary Mycosis." His figures from the city of Bangkok in Siam are most interesting. Of 100 cases presenting themselves at a hospital for treatment for tuberculosis, 5 per cent proved to be mycotic, 23 per cent spirochaete infections and the remainder were classified as tuberculosis, although in only 10 per cent could the tubercle bacillus be demonstrated. It would be interesting to see what the results



would be in different sections of our own country if a systematic search were made for the causes of chronic pulmonary disorders, employing not only the microscope but cultural methods. Mendelson suggests that especially in the southern states it might be possible to find many cases of broncho-pulmonary mycosis. It should be kept in mind that non-pathogenic fungi may occur in the sputum.

A few other parasites have to be considered. An echinococcus infection has to be ruled out. The cysts occur more frequently in the lung than the pleura, and, when the process has opened into a bronchus, shreds and hooklets may be found in the sputum giving the diagnosis. Puncture of these cysts is contraindicated, as the escape of the fluid through the opening may lead to serious reactions. The cysticercus cellulosa of the tinea solium may also occur in the lung, but is of less importance, and, as a rule, the symptoms are obscure.

Another parasite that has been found to exist in the United States is pulmonary distomatosis. This is the lung fluke so common in parts of Asia. Occasionally the fluke is expectorated, but more frequently the eggs are found in the sputum. Amebiasis has been found to be more frequent in the United States than generally supposed, as shown in the studies of Sistrunk (16), Giffin (17) and Sandford (18). This organism should be kept in mind in determining the nature of an obscure pulmonary lesion. Osler (19) states that amebic abscess of the liver is not very infrequent and, of his series of twenty-seven cases, nine perforated into the lung. Symptoms of intestinal and liver involvement will usually, however, help in the diagnosis. The ameba can be found in the anchovy sauce sputum.

Primary tumors, usually cancer, endothelioma or sarcoma, are often mistaken for tuberculosis as they in the early stage present many features of this disease, and may even go on to cavity formation and show a bronchiectatic type of sputum. However, the earliest indications, according to Osler (20), are usually at the root of the lung, and if effusion occurs it is most frequently bloody. Later pressure symptoms and bulging may occur.

Dermoid cysts have been diagnosed by means of the X-ray and occasionally by expectoration of the characteristic contents. They are most frequently found near the upper part of the sternum. The history and X-ray findings will be of help in eliminating pneumoconiosis.

Summarizing, we see that all the different disease processes just mentioned, with the exception of tumors, pneumoconiosis and echinococcus infection, can be diagnosed by the microscope or by cultural methods, and at times the microscope will settle the diagnosis in case of the echinococcus cysts. In regard to the three latter, the X-ray will

be of great help. Blood counts are not so reliable on account of the frequency of secondary invaders; however, it is said a marked leucocytosis may be found present in a coccidioidal infection. Eosinophilia may occur in cases of infection with animal parasites.

A tuberculin test or a complement fixation test is of help in ruling out tuberculosis where the bacilli are not present in the sputum. Animal inoculations will also be of help. All of these infections with the exception of blastomycosis, coccidioidal granuloma and pulmonary distomatosis, show a preference for the base of the lungs. The primary tumors favor the root of the lungs. In regard to the three exceptions, I have not been able to find enough data to make a definite statement as to the most frequent localization.

Most of the cases of coccidioidal granuloma and pulmonary distomatosis occurring in this country have been reported from the Pacific Coast. A considerable number of the blastomycosis reports have been of cases from the Middle West. Pulmonary echinococcus cysts are extremely rare in this country; most of our knowledge in regard to this condition has been furnished by students of the disease in Australia and Iceland.

With a positive Wassermann or a history of syphilitic infection, definite lung changes particularly at the base, a history of pulmonary disturbance over some period of time, negative sputum, dyspnea, and a disproportion between the extent of the lesions and the general appearance of well being of the patient, a presumptive diagnosis of syphilis of the lung is justified if the other conditions mentioned can be ruled out. This is strengthened by finding manifestations of syphilis elsewhere in the body.

The following case illustrates the importance of keeping in mind the possibility of hies in all cases of chronic lung involvement with negative sputum. The striking results obtained after anti-luetic treatment furnish additional proof that the improvement could scarcely be a mere coincidence, although the great prevalence of tuberculosis, of course, means that the two disease processes may have existed side by side. A negative tuberculin test, and the absence of tubercle bacilli after repeated sputum examinations, render the presumption justifiable that the tuberculous focus, if present, was inactive.

First seen August 25, 1919. Female; age 29 years; white; married; occupation, housework.

F. H. Father and mother, three sisters and one brother, living and well. No history of tuberculosis, cancer, nervous diseases, or any other diseases.

*Past History:* Had what was called inflammation of stomach when fourteen years old; had an illegitimate child about ten years ago. Had

tonsils removed in April, 1918. Had a miscarriage in March, 1918. Influenza in November, 1918. Does not know if she has had syphilis or not.

*Present Illness:* Frontal headaches and a feeling of feverishness have appeared at frequent periods lately. Since April, 1919, has coughed; has noticed that the desire to cough is more noticeable in the morning and when lying down. When in recumbent position on back has a peculiar wheeze in the throat. Has had night sweats the last four weeks. Pains in both sides of chest, although not severe, have been noticed for several weeks. Shortness of breath has been very marked since April, 1919. No expectoration of blood.

*Examination:* Eyes, ear, nose and throat examinations reveal nothing of importance. Abdomen: liver and spleen not enlarged; no masses felt. Glands: no enlargements. Limbs and joints; not painful, no limitation in motion. Reflexes: normal knee jerks; no ankle clonus; negative Babinski. Skin: no eruptions. Chest: Heart slightly enlarged, P. M. I. 10 cm. from mid-sternal line; no organic murmurs heard. Pulse normal in rhythm, force and frequency.

*Lungs—Inspection:* On deep inspiration lagging is noticed on left side; Littens sign is absent on left side, while present on right side. Palpation: Chest does not move as freely on left as right side. Normal vocal fremitus on right side, but is increased on upper part of left chest in back above scapula and to inner side of scapula, but absent at base.

*Percussion:* Normal percussion note over right lung and over upper lobe of left lung in front. Impaired percussion note over whole left lung in back, in axillary region, and over region of lower lobe in front.

*Auscultation:* A few fine crepitant râles heard over upper left lobe in back and numerous crepitant râles heard over lower lobe in back and front. Bronchial breathing heard over small area to inner side of scapula at level of spine.

Sputum negative for tubercle bacilli and elastic tissue. Blood Wassermann, four plus.

*X-ray:* Shadows indicative of a pathological process present in left lower lobe. Slight cardiac enlargement. Evidence of small quantity of fluid in left pleural cavity. A needle inserted in left side in back reveals the presence of a small quantity of clear serous fluid; 10 c.c. removed. The small quantity remaining was not aspirated. Microscopic examination showed lymphocytes to be the predominant cells present. No causative organism could be found.

This patient was given six injections of neo-arsphenamin followed by mercurial intramuscular injections. She improved markedly at end of first week after beginning of treatment, cough and pain disappeared. She gained in weight, and after completion of injections the râles and fluid had vanished, but, feeling well, she failed to carry out the treatment outlined. She got along nicely until about four months ago, when she had a severe attack of pain in the left side while at work, with symptoms of collapse. No lung disturbance that could explain her syncopal attack could be found. A markedly enlarged heart was demonstrated, and undoubtedly an acute dilatation had occurred. As she still had a

positive Wassermann, she was given another course of neo-arsphenamin injections with good results. This is being followed by mercury and iodides. She is now feeling very well.

This case is of especial interest, due to the associated cardiac involvement which is also probably due to syphilis. No organic murmurs have been found, and the blood pressure has been normal. The urinary examinations have so far been negative.

*Conclusions:* (1) Syphilis of the lung is probably not as rare as it is supposed to be.

2. It should be considered a possibility in all cases of pulmonary involvement where the causative agent cannot be demonstrated.

3. This possibility will be greatly strengthened by a positive Wassermann, a history of luetic infection, or the presence of syphilitic lesions elsewhere in the body.

4. These patients should be given anti-syphilitic treatment, particularly as such excellent results are obtained in uncomplicated cases.

5. The prevention of this condition consists in: (a) The prevention of syphilis. This problem Osler (21) has discussed comprehensively. (b) Proper treatment of all cases of syphilis at the earliest possible date and keeping these patients under observation for some time after.

#### BIBLIOGRAPHY

- (1) Virchow, Quoted by Lissner, *American Journal Medical Science*, 1918, vol. 155, pp. 350-379.
- (2) Stanley, *British Medical Journal*, vol. 2, pp. 802-804.
- (3) Carrera, *American Journal of Syphilis*, 1920, vol. iv.
- (4) Pottenger, *American Journal of Syphilis*, 1917, vol. 1.
- (5) Warthin, *Oxford Medicine*, vol. 11, pp. 111.
- (6) Strumpell, *Textbook of Medicine*, vol. 1, pp. 340.
- (7) Christian, Quoted by Lissner, *American Journal Medical Science*, vol. 155, pp. 350-379.
- (8) Chelmichi, (Diss.) S Leipzig, 1914.
- (9) Lissner, *American Journal Medical Science*, vol. 155, pp. 350-379.
- (10) Fournier, Quoted by Lissner, *American Journal Medical Science*, vol. 155, pp. 350-379.
- (11) Castellani, *Lancet*, May 19, 1906.
- (12) Carman, *American Journal of Syphilis*, 1918, vol. 2.
- (13) Mason, *Johns Hopkins Hospital Bulletin*, December, 1920.
- (14) Nolf, *Archives of Internal Medicine*, April, 1920.
- (15) Mendelson, *Journal American Medical Association*, 1921, vol. 77, pp. 110, *THE MILITARY SURGEON*, July, 1921, vol. xlix, p. 81.
- (16) Sistrunk, *Journal Amer. Medical Association*, 1911, vol. lxii, pp. 1507-1509.
- (17) Giffin, *Journal American Medical Association*, 1913, vol. lxi, pp. 675-678.
- (18) Sandford, *Journal American Medical Association*, vol. lxxvii, pp. 1923-1926.
- (19) Osler: *The Principles and Practice of Medicine*. Eighth edition, pp. 583-585.

(20) Osler: *The Principles and Practice of Medicine*. Eighth edition, p. 653.

(21) Osler: *The Principles and Practice of Medicine*. Eighth edition, p. 277.

Funk: *Penn. Medical Journal*, Athens, 1919-20, xxiii, 310-315. Asada: *Verhandl. d. Japan. path. Gesellsch.*, Tokio, 1917, vii, 51. Edelmann: *Wien. klin. Wochenschr.*, 1919, xxxii, 1182-1183. Kayser: *Berl. klin. Wochenschr.*, 1919, lvi, 733. Rothschild: *Munchen. Med. Wochenschr.*, 1918, lxxv, 1199. Schonfeld: *Munchen. Med. Wochenschr.*, 1918, lxxv, 1416. Rothschild: *Med. Klin.*, Berl., 1918, xiv, 824. Sugai: *Centralbe. f. allg. Path. u. path. Anat.*, Jena, 1909, xx, 193-202. Clayton: *American Journal Medical Science*, Phila., 1905, cxxix, 563-575. Roussel: *New York Medical Journal*, 1913, xcvi, 600-603. Lindvall: *Beitr. z. Klin. d. Tuberk.*, Wurzb., 1912, xxiv, 311-332. Forsyth: *Proc. Roy. Soc. Med.*, Lond., 1911-12, v, Dis., 186. Tanaka: *Virchow's Arch. f. path. Anat.*, Berl., 1912, ccviii, 429-446. Hedren: *Nord. Med. Ark.*, Stockholm, 1907, Afd. 11, 3F., vii, No. 13, 1-10. Landis: *American Journal Medical Science*, Phila., 1915, cl, 195-200. Burnham: *Boston M. & S. J.*, 1914, clxxi, 411. Bartels: *Ugeskr. f. Laeger*, Kobenhavn, 1914, lxxvi, 681-688. Tice: *Med. Clin.*, Chicago, 1917, ii, 1253-1264. Phipps: *Boston M. & S. J.*, 1917, clxxvi, 390-392. Weber: *Proc. Roy. Soc. Med.*, Lond., 1916-17, x, 23-30. Post: *Boston M. & S. J.*, 1916, clxxiv, 876-878. Rossle: *Med. Klin.*, Berl., 1918, xiv, 750. Orszag: *Beitr. z. Klin. d. Tuberk.*, Wurzb. 1918, xxxix, 141-144. Hall: *Lancet*, Lond., 1918, ii, 779. Weber: *Clin. J.*, Lond., 1918, xlvii, 19-25. Witherspoon: *South. M. J.*, Birmingham, 1918, xi, 274-278. Morris: *Am. J. Syph.*, St. Louis, 1918, ii, 231-236. Davidson: *U. S. Naval Med. Bull.*, Wash., 1918, xii, 266. Letulle: *Bull. et mem. Soc. Anat. de Paris*, 1910, lxxxv, 77. Robertson: *J. Path. and Bact.*, Cambridge, 1910-11, xv, 46-52. Watkins: *Am. J. Syph.*, St. Louis, 1917, i, 760-766. Culver: *J. Am. M. Ass.*, Chicago, 1915, lxiv, 335. Gibbes: *Southern Med. Journ.*, November, 1920.



## NOTES ON THE HISTORY OF MILITARY MEDICINE

*(Continued from January, 1922)*

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### IV. THE MIDDLE AGES

MODERN SCIENCE properly begins with the work of Copernicus and Vesalius (1543), but in the social history of Europe, the Middle Ages comprise the period between the downfall of the Western and the Eastern Roman Empires (476-1453 A. D.). During this long interperiod of nearly a thousand years, printing, firearms and the mariner's compass were invented, but science sank to a comparatively low level, and while there was a remarkable upward trend in the thirteenth century and much was eventually accomplished in military surgery and preventive medicine, anatomy, physiology and pathology were almost non-existent and internal medicine sank into what Allbutt styles "unexampled and even odious degradation." The reason for all this is not far to seek. Even before the downfall of the Western Roman Empire, Greek science had died out utterly, Greek philosophy had proved a total failure, and with the downfall of Rome, Europe became practically nationless, her peoples continually at the mercy of fierce wandering tribes of barbarians and reduced to the apathetic condition described in Shakespeare's line

"The indifferent children of the earth."

The successive blows dealt by Ostrogoth and Visigoth, Vandal, Hun and Lombard might be described as an effective macing of the human intellect, destroying all ambition, all initiative and almost all productive power. While the Orient maintained her commerce and her culture, Western Europe was reduced to a peasant status in respect of agriculture, commerce, finance, education and means of self-defense. It was a period in which everything had to be begun again, in which the older edifice of science was slowly scrapped, to be rebuilt from the ground up. What saved European civilization from utter destruction was the previous Latinization of the West by the Roman power, the conversion of the barbarians to Christianity, the upbuilding of new nations through the failure of the Feudal System, and the preservation of the literary remains of antiquity by Byzantium, Islam and the monks of the Roman Church. The growth of Christianity exerted a refining influence upon morals and a softening effect upon manners, and through these influences the Germanic and Norman

conquerors were, in a manner, Latinized. In the long run, Pope and Emperor did much for medicine through the founding of universities, the enactment of laws regulating medical practice, the development of hospitals and the organization of sick nursing. For science, however, the period was one of long, tedious gestation, aptly described by Singer as "the embryology of modern thought," and during the 12th century, medicine was dominated by "the heavy hand of the Arabian" (Osler).

### *Byzantium*

The Western Roman Empire lasted 500 years. The Eastern Empire lasted nearly a thousand years (395-1453). This was accomplished by the maintenance of an ironclad military despotism and bureaucracy and through the fact that the whole Eastern Empire was eventually encysted, as in a "calcareous shell,"<sup>1</sup> within the ramparts of Constantinople. The effect of this imposition of Roman administrative machinery upon a population ultimately Greek in cast was to keep science stationary until it finally went into retrogression. Byzantium was thus a kind of cold storage plant for the remains of Greek culture, or, as Allbutt puts it: "The chief monuments of learning were stored in Byzantium until Western Europe was fit to take care of them."<sup>2</sup> Byzantium, therefore, had no mediæval period but led an independent, stationary existence all its own, marking time in the past. The traditions of Roman law and military science were rigorously maintained, and this civilization maintained a higher general level than that of any other European state during the Middle Ages. Its history is a monotonous record of

Half-emperors and quarter-emperors,  
Each with his bay-leaf fillet, loose-thonged vest,  
Loric and low-browed Gorgon on the breast, . . .  
Born in the porphyry chamber at Byzant.<sup>3</sup>

But in the history of military medicine, the Eastern Empire becomes of singular importance. Long before the fall of Rome the military system of the Western Empire had gone to seed, its proud legions split up into small detachments of mercenary barbarians and confined to the provinces of Italy. The name "legion" last appears in the *Notitia dignitatum* of the city of Constantinople (395-407) and disappears after the time of Justinian. The names of Roman army surgeons have already disappeared from the carved inscriptions by 250 A. D.<sup>4</sup> A century later, the absolute lack of proper arrangements

<sup>1</sup> Allbutt: Glasgow, M.J., 1913, 4, s., lxxx, 323.

<sup>2</sup> Allbutt: Science and Mediæval Thought. London, 1901, 65.

<sup>3</sup> Robert Browning: Protus

<sup>4</sup> Haberland: Veröffentlich. d. Geb. d. Mil.-San.-Wesens. Berlin, 1910, Heft 42, 67-71

for care of the wounded in a battle fought by Julian and Constans against the Chionites is lamented by Ammianus Marcellinus.<sup>5</sup> In Byzantium, however, after the reign of Justinian (527-565), we find a typically modern army, organized in brigades and divisions, with field forces of disciplined regulars (financed by scutage), a complete territorial system of recruiting (5,000 men from each military district), with frontier militia, supply depots and trains, engineers, medical corps, and such organization and training as were not to be found in the West until during the 16th-17th centuries.<sup>6</sup> That the medical personnel was adequate is indicated by the anecdote of the historian Procopius (a field commander under Belisarius), in which the life of Arses is saved, after a consultation, by the clever surgery of "one of the physicians" (τῶν τῆς ἰατρῶν).<sup>7</sup> In his treatise on strategy,<sup>8</sup> the Emperor Mauritius (582-602) introduced a kind of sanitary formation for his cavalry, consisting of 8-18 unarmed *deputati*<sup>9</sup> assigned to every detachment (βάνδον) of 200 to 400 men, in addition to physicians (ἰατροί). This sanitary personnel, later called *scriboues*,<sup>10</sup> followed the fighting columns at a distance of 200 feet in order to bring the severely wounded out of danger during an engagement. To this end, the saddles of their horses had two ladder-stirrups on the left side, and flasks of water were carried to revive the faint. The bearers received a piece of gold for every wounded soldier rescued, and as they collected the arms of the wounded and of the survivors after a battle (to prevent plundering), they came in for a share of the booty.<sup>11</sup> The same organization is again described, 300 years later, in the *Tactics* of Emperor Leo (886-912),<sup>12</sup> showing the rigidity of Byzantine military administration.

<sup>5</sup> Frölich, *Arch. f. klin. Chir.*, Berl., 1880, xxv, 311. Frölich translates this passage as follows: "Each side looked after its wounded as best it could and according to the number of attendants (*curantes*); some, severely wounded, and bleeding to death, reluctantly breathed their last; others, transfixed by spears and fallen to the ground, were cast aside, as if corpses; others had so many wounds that it was forbidden to do anything for them, that these suffering ones should not be further tormented by useless manhandling; many, on account of the uncertain issue in the withdrawal of weapons from wounds, suffered agony worse than death." Ammianus Marcellinus: *Herum Gestarum*, xix, 215. Haberling cites further the case of Emperor Valentinian, who, sustaining a hemorrhage on the Danube (325 A. D.), could not obtain a physician to do venesection, because all his army surgeons were engaged in combating an epidemic in camp.

<sup>6</sup> Capt. C. F. Atkinson, *Encyclop. Britann.*, 11th ed., Cambridge, 1910, ii, 596.

<sup>7</sup> Procopius: *De bello Gothico*, ii, 2 (Teubner, 157-158). Cited by Haberling, *op. cit.*, p. 69.

<sup>8</sup> Mauritius: *Ars militaris*, ii, 8. Cited by Kühn and Frölich.

<sup>9</sup> According to Kühn, the reading is either *ἑσποτάτος*, drink-giver, or *ὑποτάτος* (*deputatus*), one deputized or assigned to a particular task. Both readings, Kühn says, are employed in the *Tactics* of Leo.

<sup>10</sup> *σκριβουες* is construed by Frölich as the equivalent of the *mileses hastati* of the later Latin writers, i. e., those who guarded the person of the general and were often sent by the emperor on commissions in the distant provinces. Kühn, *Program* vii, Leipzig, 1826, 7, footnote 1.

<sup>11</sup> Frölich, 313-314.

<sup>12</sup> *Leonis imperatoris Tactics*, iv, 15, xvi, 51; 53, 119. Cited by Kühn and Frölich.



The army surgeons are classed by Leo as non-combatants (*ἀμαχοί*), the litter-bearers (*deputati*) are chosen from the weaker elements in the command, and the old arrangements about ladder-stirrups and water-flasks are maintained. In the *Tactics* of Constantine VII Porphyrogenitus (911-959),<sup>13</sup> the selfsame organization is monotonously preserved. The *Tactics* of Emperor Leo, regarded as the best of all the Byzantine treatises on military science, contains at the end an impressive passage on the absolute necessity of medical personnel to armies, and the following charge to the commanding general on the care of the wounded:

Give all the care you possibly can to your wounded, for if you neglect them, you will make your soldiers timorous and cowardly before a battle, and, not only that, but your personnel, whom you might preserve and retain by proper consideration for their health and welfare, will be otherwise lost to you through your own negligence.<sup>14</sup>

On the score of military hygiene, Byzantine practice was probably based upon the precepts in the treatise on military science of Vegetius,<sup>15</sup> who lived in the reign of Valentinian II (375-392 A. D.).

Vegetius maintains that large bodies of troops should not camp too long in any one place, since epidemic diseases arise from corruption of the air and water and can only be prevented by frequent change of camp. Troops should not camp upon dry hillsides, devoid of shade, and, in summer, should always be provided with tents. One drink of polluted water may be "as potent as poison" in starting an epidemic. Daily exercises, in the opinion of experienced commanders, are better for the health of soldiery than physicians. In periods of great heat, all marching should be done before sunrise. In winter, little can be expected of the soldier if he is allowed to freeze. There should be no lack of fuel and clothing. Hunger is more cruel than the sword. Recruits from cold climates are harder and more resistant to disease than those from warmer climes; and the army must be continually strengthened by recruits from the farmlands, who are stronger than the city-bred. The recruit should be young, but strength is more essential than size; he should be keen-eyed, with head erect, broad chest, long muscular arms, capable hands, slender flanks, with thighs, calves, and feet not distended by superfluous flesh but hard with accumulated muscle. It is best to discharge the unfit at once. It is the duty of commanding officers to provide good water, proper food and medical attention for the sick. The camp commander should look after the patients in their tents, the physicians who attend them and the expenses incident thereto.

In Byzantium, some provision appears to have been made for asylums for disabled soldiers, e. g., the perhaps mythical retreat said

<sup>13</sup> Constantine: *βιβλίον τακτικόν* (ed. Meursius, 1617, p. 1280). Cited by Kühn and Frölich. In closing references from the Greek and Latin writers it may be repeated that all the important bibliographical references to military medicine in classical antiquity were first given by C. G. Kühn in the academic programs published by him at Leipzig in 1821-27. Had these Latin dissertations been translated into a modern language, much labor might have been saved to all subsequent investigators and Kühn would have been credited with his actual performance, viz., the first and, in its time, the most exhaustive investigation of the whole subject before Briau and Frölich.

<sup>14</sup> Leo: *Tactica*. Epilogue (Leyden, 1612, p. 381). Cited by Habering, p. 70.

<sup>15</sup> Vegetius: *De re militari*, iii, 2. Cited and translated by Frölich, *op. cit.*, 311-312.

to have been founded by Zotikos at the instance of Constantine (306–337), the Lobotropheion of Justin II (565–578) for crippled soldiers, and the Orphanotropheion of Alexis Comnenus I (1081–1118) for sick and invalided soldiers.<sup>16</sup>

The medical texts of the Byzantine period are, in the main, compilations, but the principal writers, Oribasius, Aetius and Paul, have preserved in their texts much of earlier Greek medicine that might otherwise have been lost. Aetius describes tonsillotomy, urethrotomy, operative treatment of hæmorrhoids and ligation of the brachial artery above the sac for aneurism. Alexander of Tralles (525–605) first recommended colchicum for gout, perhaps the most common malady at the Byzantine court.<sup>17</sup> The sixth book of the Epitome of Paul of Ægina (625–690) is the best treatise on surgery in its period and was the standard source of authority up to the twelfth century. The chapter on military surgery (VI, 88) has been Englished by Francis Adams in his translation of Paul (Sydenham Society, ii, 418–422). Like that in Celsus, it deals with the extraction of spear and arrow points, and was copied later by all the Arabian physicians.

The different kinds of weapons are minutely described, and while the general directions for extraction follow the lines laid down by Celsus, more than half of Paul's chapter contains new material, on the extraction of missiles from the different organs and viscera and on the treatment of wounds from the poisoned arrows used by the Dacians and Dalmatians to destroy wild animals. He points out that extensive suppuration of viscera like the liver, omentum, peritoneum and uterus, may not necessarily be fatal; describes the characteristic symptoms of wounds of the brain and its membranes, and of the chest, lungs, heart, diaphragm, abdominal viscera and bladder in an entirely modern manner, with good practical directions for removal of the missile from these parts. He recommends tracheotomy in angina, trephining in wounds of the brain, and ligation on both sides in wounds of the arteries.

In wounds of important viscera, with fatal symptoms, and where extraction would lacerate delicate tissues, Paul recommends that "we decline the attempt, lest while we do no good we expose ourselves to the reprobation of ignorant people. But if the result be dubious, we must make the attempt, having first given warning of the danger." For reasons which will appear, this rule became the guiding principle of all surgeons up to the 16th century.

<sup>16</sup> K. Sudhoff: *Jahresk. f. Arch. Fortbild.*, München, 1917, viii, 46. In the ancient Greek cities the ἀδύνατοι, or permanently disabled war invalids, were given a small daily pension, increased to large sums by Alexander the Great in his Indian campaigns. In Rome, separate colonies for invalids were set apart, e. g., at Italica in Spain by Scipio Africanus, at Nicopolis in Asia Minor by Pompey, and also in Egypt (Sudhoff: *op. cit.*, 45). In the Codex of Theodosius (379–395 A. D.), veterans and invalids could hold lands without taxes and were provided with seed, fruits, cattle and money to run their farms. For the Latin text and commentary, see Sudhoff: *Mitt. z. Gesch. d. Med.*, Leipz., 1917, xvi, 431–433.

<sup>17</sup> See E. Jeannelme: *La goutte à Byzance*. *Bull. Soc. franç. d'hist. de méd.*, Paris, 1920, xiv, 137–164.

## Islam

(732-1096)

The Mohammedan power converted the straggling desert clans into military and social units, capable of acting as nations, and, once it had established itself, proved highly favorable to the arts and sciences. The Saracens preserved the remnants of Greek culture, were pioneers in chemistry and geology, had a most extensive pharmacopœia, built great hospitals and numbered some of the greatest physicians of the time. What little we know of their military medicine is contained in the writings of these men, as there is no mention of the subject in the Arabian Nights.

Of the physicians of the Eastern or Bagdad Caliphate (750-1258), the clinician Rhazes (860-932), famed for his original account of small-pox and measles, gives in his *Almansor* (XIII, 6), a number of sensible precepts on military hygiene:

Camps should be pitched in summer on hills and high places, tents being directed towards the north wind, with plenty of air-space between tents. Animals should be kept as far from the tents as possible. In winter, camps should be placed in low-lying places, preferably at the foot of hills or mountains, tents being directed towards the east and south, alternate pairs of tents being joined together. When moist south winds blow, rations should be cut down, wine should be interdicted and more military exercises taken. When the air is dry, just the opposite régime should be enforced. Sick cattle should be kept far from the camp, in low windless places. Dangerous living animals about the camp should be driven away or smoked out of their holes and destroyed. Poisonous, odorous plants and trees should be burned or the camp site should be above them. Food and drink, as causing many diseases, should be inspected with great caution.<sup>13</sup>

The same work contains (xxv, 7) a chapter on the extraction of spear-points and darts, which adds nothing new to what is already given by Celsus and Paul. The same thing is true of the chapter on military surgery (IV, 4 fen. II, 10) in the Canon of Avicenna (980-1036),<sup>14</sup> otherwise one of the greatest of physicians, the founder of geology, who described anthrax and who practised the Hippocratic method of treating spinal deformities by forcible reduction.

In the Western or Cordovan Caliphate (655-1236) flourished Albueasis (eleventh century), greatest of the Arabian surgeons, whose treatise became the standard authority after Paul. The *Altasrif* of Albueasis contains (X, 84-85, 94) chapters on the treatment of thoracic and visceral wounds and the extraction of arrows, which follow the lines laid down by Paul, particularly in semeiology, and are interesting

<sup>13</sup> Translated by Frölich in *Arch. f. klin. Chir.* Berl., 1882-83, xxviii, 864.

<sup>14</sup> See Frölich: *Arch. f. Klin. Chir.* Berl., 1884, xxx, 745-752.

as containing pictures of the surgical instruments employed and several clinical cases.<sup>20</sup>

### *The Feudal System*

On Christmas Day, 800 A. D., Charlemagne was crowned in St. Peter's and the Holy Roman Empire came into being. When this vast empire was partitioned after his death (814), feudalism gained its ascendancy. Although Charlemagne's own army was a strong organization of veterans, with supply trains, financed upon the democratic principle that every 3-4 men in the kingdom should maintain one of themselves as a soldier,<sup>21</sup> feudal armies were levied upon a territorial basis, on the theory that the king received his lands from God and parcelled them out to his vassals in return for 1-3 months' military service per annum, rendered when occasion required. This arrangement was carried down to the serfs or villeins, who tilled the soil. Magnificent in theory, the effect of feudalism in practice was toward extreme individualism and decentralization. Each powerful vassal became a little monarch in his own right, often at odds with his sovereign, and military operations of moment were carried forward with difficulty. Raids and assaults by mailed cavalry were the principal mode of offensive, the infantry, made up of undisciplined peasantry, went into decline,<sup>22</sup> and chivalry and knight-errantry being individualistic and aristocratic, led to lawlessness and operated fatally against true military discipline. The effect of this order of things upon military medicine was in every way pernicious. The few capable physicians and surgeons of the time were attached to the persons of kings, popes, nobles, princes of the church, and other mediæval overlords, and accompanied military leaders on their campaigns, but nothing whatever was done for the health and well being of the individual soldier. Body-physicians of great personages were richly rewarded for their services, but the surgical treatment of the common people was in the hands of wandering incisors, barber-surgeons and quacks of outcast status. There was no organization for the relief of the wounded, and as late as the sixteenth century Monthue declared that the best thing that could happen to a fighting man in battle was to be killed outright by a good arquebusade.<sup>23</sup> In a disorganized state of society, in which every strong overlord might be against his master or his fellows, surgical practice, even in the best hands, was sometimes bungling, came to be interdicted by the Church

<sup>20</sup> For the military surgery of Albucaasis, see the account by Francis Adams in his *Paulus Aegineta*, Sydenham Society, London, 1846, ii, 424-425, and Frélich: *Arch. f. klin. Chir.*, Berl., 1884, xxx, 364-376.

<sup>21</sup> Atkinson: *op. cit.*, 596.

<sup>22</sup> Atkinson, 596-597.

<sup>23</sup> Cited by L. Thomas: *Lectures sur l'histoire de la médecine*, Paris, 1885, 17.

(*Ecclesia abhorret a sanguine*), and was despised and feared by the nobles as well as the people. The mediæval epics and romances of chivalry describe the agony of uncertainty, even upon the withdrawal of a spear from a wound, as worse than death itself. The greatest surgeons of the time advised their professional brethren not to undertake a major operation upon a great person without a definite guarantee of their personal safety, since they were liable to torture, mutilation or murder, in the event of a fatal issue. Operations like lithotomy, couching for cataract, and radical cure of hernia passed into the hands of outcast or barber-surgeons, and from this class came eventually such remarkable men as Paré, Felix Würtz and some of the earlier surgeons general of the Prussian Army. Of this rehabilitation of operative surgery by the lower caste, Allbutt says conclusively:

Happily, if to the high stomachs of our mediæval forefathers, surgical dabbings were common and unclean, still there remained some eyes curious enough and some fingers dexterous enough to carry the art back to the skill of Hippocrates and forward to the skill of Lister, and by the mouths of barbers and cutters, rather than of the pharisees of the colleges, medicine breathed her lowly message to her children.<sup>24</sup>

### *The Crusades*

(1096-1272)

In the ninth century, the Scandinavian vikings began their raids upon the high seas, but wherever they established themselves, whether in Russia, France, England or Sicily, they were easily assimilated by the peoples among whom they settled and were rapidly converted to Christianity. As we see their lithe figures in the Bayeux Tapestry or the cathedral windows at Chartres, clad in chain-mail armor, from neck to knee, with pointed helmets, long shields and spears, the actions depicted suggest the incessant itch for fighting which was to make them, as Wells says, "the will and power of the Crusades."

In preaching the First Crusade at Clermont in 1095, Pope Urban II said:

Up till now, ye have undertaken unjust wars; in your insensate fury ye have discharged upon one another's houses the arrows of avarice and pride. Now, I propose to you wars which bring in themselves the glorious recompense of martyrdom, which will be the subject of eulogies from the present time to posterity.<sup>25</sup>

In like manner, the Abbé Guibert de Nogent said:

Before the people set out upon this great expedition, the Kingdom of France was given over to trouble and the most cruel hostilities. Brigandage, incendiarism, attacks upon the public highways, combats excited only by unbridled cupidity, went on everywhere and without cessation.<sup>26</sup>

<sup>24</sup> Allbutt: *The Historical Relations of Medicine and Surgery*. London, 1905, 119-120.

<sup>25</sup> Cited by Cabanès: *Chirurgiens et blessés à travers l'histoire*. Paris, 1918, 81.

<sup>26</sup> Guibert de Nogent: *Gesta Dei per Francos*. Cited by Cabanès, 81.

One effect of the Crusades, then, was to divert the warlike energies of the Nordics away from Western Europe to a distant object, namely, the menace of the Mohammedan and Mongol invasions, and while the Normans took up the gage with the cheerful "We are ready" of Josephus' Romans, the eight successive ventures occupied nearly two centuries and cost several million lives. The principal results were to increase the power of the Papacy, to whet the spirit of adventure and exploration, to enlarge the horizon of the mediæval peoples by contact and commerce with the East, to postpone the fall of Byzantium for 300 years, to destroy the power of the feudal aristocracy through the loss of their estates, and to fasten chivalry and knight-errantry upon Europe until the end of the fourteenth century. To the improvement of military science the Crusades contributed nothing whatever. Of the medical arrangements of these expeditions we know little, for like all feudal forces they were, at the start, undisciplined caravans; but that physicians were in attendance upon the leaders is evident from the narrative of Baldwin's wound, the first important casualty in the First Crusade. Sustaining a spear thrust in the thigh and the reins, with syncope from hæmorrhage, he was placed in a litter, "and thanks to the skill of the physicians and to his own strong constitution, was soon cured of a wound reputed mortal."<sup>27</sup> The miniatures in the MS. of *Lancelot du Lac* (Bibliothèque Nationale, Paris)<sup>28</sup> show that these litters, also described in the Old High German epics, were suspended between two horses, either tandem or abreast. The wounds incurred were either smashing blows on the skull from sword or battle-axes, incised wounds from slashing, or punctured wounds by spear or arrow, with great danger from external clotting and internal hemorrhage.<sup>29</sup> Fighting in the hot sun, in the heavy hauberk or chain armor of the Normans, produced many cases of heat-stroke. The characteristic long triangular shield of the Crusaders was sometimes employed as a litter, to bear the wounded to safe places. On the Fifth Crusade (1216-20) scurvy was first noted and described by Jacques de Vitry, and on the Seventh Crusade (1249-54) the same disease was noted by Joinville (1250). Dysentery, the pest, camp typhus and pernicious fevers exacted a heavy toll of lives on all the later Crusades. In spite of the religious motive of the

<sup>27</sup> Cabanès: *op. cit.*, 89.

<sup>28</sup> For reproduction, see Cabanès, p. 81.

<sup>29</sup> Punctured wounds from spears and arrows occasioned but little bleeding, whence fatalities from internal hemorrhage were common (Cabanès, p. 62). This was the rationale of cupping, leeching and wound-sucking in such cases, and wound-sucking was also associated with the idea of poisoning of wounds by weapons. If the brain, chest or abdomen were deeply pierced by a spear or arrow, the imbedded weapon could not be withdrawn without great laceration of friable tissues: the patient's chances, then, were either to bleed to death from internal hemorrhage or to die from the shock of sudden and violent withdrawal.

Crusades and the high character of many of the leaders, these expeditions were usually accompanied by great hordes of female camp followers, and the general effect of wandering soldiery was to relax morals everywhere. But as syphilis was in the nature of a mild endemic spirochaetosis up to the end of the fifteenth century, we find no references to venereal disease in armies before that time.

One far-reaching result of the Crusades was the creation of a number of knightly orders, which, as they grew in wealth and power, were destined to exert great influence upon the subsequent hospital movement of the Middle Ages and upon the organization of religious nursing orders that went along with it. Of these, the Knights Templars was purely military, while the Hospitallers or Knights of St. John and the Teutonic Knights existed to defend the Holy City, to aid and protect pilgrims and to nurse the sick. When Godefroi de Bouillon captured Jerusalem on July 15, 1099, the Crusaders assumed possession of the great Hospital of St. John of Jerusalem, originally built by the merchants of Amalfi for the benefit of sick and indigent pilgrims. The order thus established, known as the Hospitallers of Jerusalem, became in time the Knights of St. John (1211), the Knights of Rhodes (1311), the Knights of Malta (1530), and while the establishment at Malta was broken up by Napoleon in 1798, the order still keeps up its traditions in England and Italy.<sup>30</sup> The order of The Teutonic Knights of St. Mary's Hospital at Jerusalem grew up around a hospital established there by the Germans in 1143 and around another erected at Acre by merchants of Bremen and Lübeck about 1190-91. This order had its headquarters at Acre for a century (1191-1291), but in 1309 it transferred its seat of government to Marienburg, where several fine hospitals and a *hôtel des invalides* were built. In 1229 the Teutonic Order began to establish strong fortresses all over Prussia, after the fashion of the Normans in England, and by the fourteenth century it had practically subjugated all of Prussia and Lithuania, which conquests it was destined to hand on to the Hohenzollerns (1525). The castles, hospitals and chapter-houses erected by the Teutonic Knights all over Eastern Prussia were, from a sanitary viewpoint, the finest structures of the Middle Ages, having subterranean heating plants and water-piping (or wells sunk on the premises), baths and wash-rooms, chimneys specially designed to carry off the thick vapors of torch-lighting, rooms arranged around a great central court, with arcades, and *Dansker-*

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<sup>30</sup> For the early and subsequent history of this Order, see Rose G. Kingsley: *The Order of St. John of Jerusalem*, London, 1918 and Major A. C. Yate: *The Knights Hospitallers and Ambulance Work in War*. Jour. United Service Inst., London, 1900, xliv, 1099-1138.

*anlagen* or tower-latrines, separated from the main building by lengthy galleries, with running water-courses underneath to remove excreta.<sup>31</sup>

### *Wound-Treatment in the Mediæval Epics and Romances*

In the *Germania* of Tacitus we get the first inkling of the part to be played by women in the care of the wounded during the Middle Ages:

The strongest incentive to courage lies in this, that neither chance nor casual grouping makes the squadron or the wedge,<sup>32</sup> but family and kinship; close at hand, too, are the dearest, whence is heard the wailing voice of woman and the children's cry; here are the witnesses who are in each man's eye most precious; here the praise he covets most. They take their wounds to mother and wife, who do not shrink from counting the hurts and demanding a sight of them;<sup>33</sup> they minister to the combatants food and exhortation. Tradition relates that some lost or losing battles have been restored by the women, by the incessance of their prayers and the baring of their breasts; for so it is brought home to the men that the slavery, which they dread more keenly on their women's account, is close at hand. . . . Further, they conceive that in woman is a certain uncanny and prophetic sense; they neither scorn to consult them nor slight their answers (*Germania*, 8).

This note of the special fitness of women as nurses for the sick and wounded is constantly sounded in the mediæval epics and romances of chivalry. Care and treatment of the wounded became a particular function of great ladies.

From wandering "wise women" (*weise Frauen*) and "wild women" (*wilde Frauen*), who culled healing plants and practised herbal medicine, the German warriors are said to have acquired skill in wound-treatment. Thus, in the epic of *Gudrun* (1210), an old warrior's proficiency in medicine is described as such that his possible earnings could not be carried away on a camel's back:

Er war der Heilkunst kundig, man hat es längst vernommen,  
 Erlernt hat es der Reeke von einem wilden Weibe, . . .  
 Da fand der Heilkunst Meister viel zu thun umher.  
 Sollt' er sich Gut verdienen im grossen Kriegesheer,  
 So könnten es Kameele nicht von der Stelle tragen.<sup>34</sup>

Long before this time there are plenty of evidences of wound-treat-

<sup>31</sup> Sudhoff: *Dresden Catalogue*, 1911, pp. 155 and 159 (items 5686-5698). Sudhoff also notes the superior sanitary arrangements of the Palazzo Davanzati in Florence (1300), recently restored. In point of architectural beauty, such mediæval structures as the Musician's House at Reims, the house of Agnes Sorel at Orleans, or the Hôtel de Clugny (Paris), rose to great heights of perfection, but the sanitary arrangements were usually poor. Flinders Petrie observes that the Norman castle, "with its jealous corkscrew stairs," was conditioned by the fact that "almost any man was a possible assassin, and the greatest care was needed for safety against open or private attack on leaders" (*Some Sources of Human History*, London, 1919, p. 36).

<sup>32</sup> *turma* (squadron), a cavalry formation; *cuneus* (wedge), an infantry formation.

<sup>33</sup> "Ad matres ad conjuges vulnera ferunt: nec illæ numerare aut exigere plagas pavent." *Exigere* has taxed the ingenuity of the commentators; some are tempted by the reading *exaugere*, which would imply wound-sucking.

<sup>34</sup> *Gudrun*, viii, 5, lines 526-531. Cited by Frölich: *Deutsches Arch. f. Gesch. d. Med.*, Leipzig, 1880, iii, 229.



ment by barbarians, e. g., on a vase of the fourth century B. C., excavated at Koyl-Oba in the Crimea, which shows Scythian chieftains extracting a tooth and bandaging a wounded leg; or in the references in the Norse Eddas (*circa* 874 A. D.) to healing herbs, cauterization and other barbaric phases of wound-treatment. In the *Nibelungenlied* we read that the King of Burgundy and his brother looked after the transportation and care of their wounded vassals, placing them in comfortable beds; and that "skilled leeches, who healed the heroes after battle, were offered unweighed silver and bright gold."<sup>35</sup> In the later epics and romances, whether of Germany, France or England, women of high degree appear everywhere as nurses of the sick and healers of the wounded, the most celebrated being Queen Isolde of Ireland (of the Tristram legend), who figures in all the Arthurian romances. In the *Chansons de Gestes*, the *Parzifal* of Wolfram von Eschenbach (1204) or the *Mort d'Arthur* of Sir Thomas Malory (1485), it is either a hermit or the fair lady of some nearby castle who binds up the knight's wounds, when this service has not been rendered by one of his fellows; in the many accounts of battle-wounds in the *Chanson de Roland* there is only one reference to wound-dressing, viz., where Roland tears up his tunic to make a compressive bandage for the wounded Turpin. From the scattered details in these epics,<sup>36</sup> we get a composite picture of this phase of mediæval custom, which, with some exaggerations, is perhaps as close to fact as the homely details of English life in Crabbe or Wordsworth or Tennyson.

We see the wounded knight laid upon the ground, his wounds examined, washed and bandaged, often with a wimple (*Kopftuch*) from a woman's forehead;<sup>37</sup> the various practices of giving a stimulating wound-drink<sup>38</sup> to relieve faintness, of pouring oil or wine into wounds, of stanching hemorrhage or relieving pain by sundry herbs; of wound-sucking to prevent internal hemorrhage,<sup>39</sup> the mumbling of charms over wounds;<sup>40</sup> the many balsams, salves and plasters used in wound-dressing; the feeling of the pulse in the cephalic, median and hepatic veins to ascertain the patient's chances of recovery;<sup>41</sup> the danger of suffocation or heat-stroke from the heavy visored helmet and coat of mail; the eventual transportation of the patient by hand, on shields or litters, on horseback or on litters attached to horses;<sup>42</sup> the sumptuous

<sup>35</sup> Frölich, *op. cit.*, 229.

<sup>36</sup> For the French epics and romances, see Cabanès: *Chirurgiens et blessés à travers l'histoire*, Paris, 1910, 51-74. For the German, W. Haberling: *Die Verwundetensorge in den Heldenliedern des Mittelalters* (Jena med. hist. Beitr., 1917, Heft 10). For Malory's *Mort d'Arthur*, G. M. Gould and W. L. Pyle: *King Arthur's Medicine*. Johns Hopkins Hosp. Bull., Balt., 1897, vii, 239-246.

<sup>37</sup> Wolfram von Eschenbach: *Parzifal*, x, 141-142. Cited by Haberling.

<sup>38</sup> See A. Raubach: *Ueber die Wundtränke in der mittelalterlichen Chirurgie*. Berlin, 1893.

<sup>39</sup> e. g., *Parzifal*, x, 94-109.

<sup>40</sup> *Parzifal*, x, 143.

<sup>41</sup> e. g. in the *Krone* (lines 6653-6671) of Heinrich von Türlin (1220), cited by Haberling, p. 19.

<sup>42</sup> For methods of transportation, see Haberling, 36-39.

chambers and couches reserved for the high-born, and the calling in of physicians," usually from the famous schools of Salerno or Montpellier, in grave cases. The ministrations of womankind are always depicted with great charm, and prelude the organization of sick nursing in the later mediæval period.

In the *Chronicles of Froissart* (1337-1410), the *Herodotus of the Hundred Years' War* (1336-1453), we can glean many details of the military medicine of the fourteenth century. The tales of instant death or of cleavage of the body or the skull by smashing, heavy-handed sword strokes are as frequent, and perhaps as exaggerated, as those in the *Chanson de Roland*; but in Froissart, the constantly recurring references to bringing the wounded to some house nearby (*au logis*) and to getting them into a comfortable condition by suitable dressings (*mettre à point les narrés et les blessés*) lead to the conclusion that this was common practice in the French army in the period.

Beyond these simple details, nothing whatever is related as to the further history of the wounded; only the Homeric alternative: death or recovery. There were apparently no professional surgeons attached to these fourteenth century armies. Evacuation and wound-dressing were performed by comrades; the wounded nobles were dressed by their pages and squires, and litters were sometimes ordered to convey them to safe places in nearby fortresses or cities. The old chronicler revels in lengthy details about the food supplies—the biscuit, salt meats, cereals, wines, beer (*cerroise*), and the beef, mutton and pork on the hoof. He tells of the poverty, penury and abstemious diet of the Scotch soldiers, of their worries lest any wounded be left behind; of the national concern of the English for creature comforts, their cooking stoves, handmills for grinding grain and lavish commissariat; of the traveling kitchens, bakeries and portable barracks of the French; the vinegar doled out as a ration in lieu of wine, as among the Romans; the boxes of salves, bandages and lint in the supply trains. Froissart's account of the camp at Chisay (Poitou) in 1372 may be compared with the Roman camp in Josephus. He describes at length an epidemic of jaundice (1378), a probable epidemic of typhus (1385), the epidemic of plague, of gastro-intestinal type, which caused the raising of the siege of Lisbon (1384), and a number of cases of heat-stroke (1391). Dysentery and malarial fever appear, from his descriptions, to have been the regular scourges of the French army at this time."

### *Further Progress in Military Medicine and Surgery*

To England is due the credit of making the first attempt at an organized medical service in the Middle Ages, apart from the Byzantine Empire. Withington<sup>45</sup> accounts for this innovation as follows:

When Prince Edward was stabbed in Palestine, it is very doubtful whether the wound was sucked by his wife; but there is good evidence that it was excised by an English surgeon, and the success of the treatment perhaps inspired him with respect for the healing art, for we find him accompanied in the invasion of Scotland (1299-1301) by no less than seven medical men. They included a king's physician and two

<sup>41</sup> In the French literature of the period, the laic barbers or apothecaries are styled *mirez*, the clerical physicians *médécins*.

<sup>42</sup> For a full account of military medicine in Froissart, giving all the citations, see the close study by médecin-major Henri Favrier in *France médiévale*, Par., 1901, xlviii, 409; 452; 1902 4, 19.

<sup>45</sup> E. T. Withington: *Medical History*, London, 1894, 223-224.

juniors (*raletti*), a king's surgeon and two assistants (*socii*), and a simple surgeon. The king's physician and surgeon each received a knight's pay—two shillings daily; and the others, who ranked as esquires, half that sum. That they found plenty to do is indicated by the fact that the chief surgeon got compensation for three horses killed in Scotland "on the king's service." But this germ of a medical staff seems to have undergone no further development,<sup>4</sup> for we hear nothing of military surgeons during the wars of Edward III, except that the Welshmen who fought at Crécy were accompanied by one of their own race. In the following century appear the often-quoted names of Nicholas Colnet, physician, and Thomas Morstede, surgeon, who went with Henry V to Agincourt. Both were attended by three mounted archers, and Morstede had, in addition, twelve members of his own craft as his assistants. Colnet and Morstede were to receive one shilling, and their attendants six pence per diem, together with a share of the plunder, and their part of "the usual bounty," viz., 100 marks (£66 13s. 4d.) per quarter for every thirty men during the actual campaign. If they got all this they were well paid indeed, but only one receipt has come down to us, in which Colnet acknowledges the payment of £8 6s. 8d. as half-quarter's salary for himself and his archers. Another surgeon, William Bredewardyn, seems to have been afterwards associated with Morstede, and they were allowed two waggons and a chariot for their baggage.

Military surgery was backward in mediæval France, England and Germany, for the reason that the general practice of surgery among the people was in the hands of barbers and bath-keepers, whose avocations were venesection, cupping, leeching, giving enemata and extracting teeth. About 1201, the Collège de St. Côme was founded in Paris by Jean Pitard who had accompanied Saint Louis (IX) to the Holy Land, and divided its membership into the clerical "surgeons of the long robe" and the lay-barbers or "surgeons of the short robe." It was not until 1372 that the latter were permitted to treat wounds. As time went on, both clerics and barbers were despised by the internists. In England, the master surgeons formed a separate guild in 1368, combined with the physicians about 1421, while the barbers obtained a separate charter in 1462. In Germany, barber-surgery was first pronounced "honorable" by Emperor Wenzel in 1406. The constant strife between these three guilds was not composed for centuries. Meanwhile the Middle Ages numbered some very eminent surgeons, notably Roger of Palermo, Hugh of Lucca, Bruno of Longoburg, and Theodoric, Bishop of Cervia, all of whom were pioneers of the dry or Hippocratic (aseptic) method of wound treatment, in which they were later sustained by Henri de Mondeville (1260-1320), a pupil of Lanfranc, and opposed by

<sup>4</sup> Most of the efforts at organization and administration were tentative and fitful, e. g., the rule of Adolf of Nassau that wounds should be bandaged in camp and not in the field (1298), or the privilege of "un chirurgien pour leur curer leurs playes, blessures et noieures" accorded to the police organization known as the *sergents du verge du Châtelet* at Paris in 1405. Frölich (*op. cit.*, 238-239) records the indiscriminate slaughtering of the helpless and wounded in the Swiss and German wars, e. g., at Sempach (1386) and Döffingen (1388), and by the Turks at Nicopolis (1396). Mutilation of the wounded and of prisoners by Turks after a battle is the subject of an elaborate engraving in Gottfried's *Chronik* (1629).

Guy de Chauliac (1300-68), the most learned and versatile surgeon of his time, Saliceto (1210-77), who sutured nerves, recognized the venereal cause of chancre and described renal dropsy, had seen military service, as had Hugh of Lucca, John of Arderne (1306-90), who devised an admirable operation for anal fistula, and the Fleming, Jean Yperman (1295-1351), who made many innovations. The Bavarian army surgeon, Heinrich von Pfolspenndt, first mentions powder burns and describes the extraction of bullets by means of the sound (1460), while gunshot wounds are first described in detail by the two Alsatian military surgeons, Hieronymus Brunschwig (1497) and Hans von Gersdorff (1517). These treatises, however, belong to the literature of the German Renaissance.

### *Public and Military Hygiene in the Middle Ages*

The Feudal System, with the intense individualism and fierce rivalries of its overlords, did not make for the spirit of cooperation and subordination to the common weal which are essential to good government, and as part of the biological process of upbuilding nations, the spirit of the times became more and more collectivistic. Of this historic phase Allbutt gives an illuminating exposition:<sup>17</sup>

If we inquire more closely how medicine fared in the fiery youth of modern Europe, we may offer at any rate two parts of the answer: first, the iron rule of prince and prelate, wicked as individual rulers have been, was possible because the peoples felt instinctively the radical and universal need of the age to be that the elements of the new Europe should be welded into a stable and coherent whole. This passionate idea of unity, called now the Church, now the Empire; here visible as the feudal tramp of the crusades, there as the tyrannous vociferations of the schools, would brook no schism, ecclesiastical, social or personal. As of every other sphere, so this spirit of domination took possession of Medicine, and therein set up the idolatry of Galen as inexorably as that of Aristotle in the sphere of philosophy. Whatever at one period were the constructive effects of this despotism, when it had outlasted its time it became as oppressive to Medicine, and to all knowledge, as formerly it had been socially integrative.

Secondly—or indeed it is another aspect of these reflections—the soul of the Middle Ages was a collective soul; its great works were the offspring not of individuals but of peoples. Who built the minsters; who painted the windows and the Books of Hours; who wrote the liturgies and chansons, we know not. As the churches, the liturgies, the manuscripts, the poetry and drama were achievements not so much of persons as of congregations, so also mediæval learning was for the most part the learning of inspired crowds at the heels of a rhetorician.

Thus all this mediæval achievement, fervid and beautiful as it was, could not do much for science; nor even for the intellectual harmonies of the fine arts. As the mediæval spirit was multiform and catholic, the Greek spirit on the contrary was choice and personal, and owed its being to individuals—to Ictinus and Mnesicles, Phidias and Polygnotus, Homer and Æschylus, Plato and Aristotle, Mantegna and

<sup>17</sup> Allbutt. *The Historical Relations of Medicine and Surgery*. London, 1905; Preface, pp. ix-xi.

Donatello. The Greek was an individualising and an emancipating spirit, the mediæval collective and entralling—a genius of assemblies and associations of men.

The most striking effect of collectivism was the development of public hygiene, in which the rulers, physicians and public officers of the Middle Ages did their best work. As in the first half of the nineteenth century, these developments were necessitated by the terrible ravages of epidemic diseases, notably the bubonic plague or Black Death (1348), otherwise known as the Great Mortality because it destroyed over one-fourth of the entire human race, leprosy, syphilis, influenza, St. Anthony's fire (erysipelas or ergotism), sweating sickness and Plica Polonica. These diseases were spread in epidemic proportions by wandering soldiery and outlaws and through the squalid, crowded condition of the population in the walled mediæval towns. In the 14th century, some eight diseases, viz., plague, phthisis, epilepsy, scabies (syphilis), erysipelas, anthrax, trachoma, and leprosy, came to be regarded as contagious, and measures were taken to isolate carriers, to prevent them from entering cities, to prohibit them from selling food or beverages, or to drive them from communities. This doctrine of "eight diseases" originated with Rhazes in the 10th century, was stereotyped in a current Latin verse and was written into the public ordinances of towns. The leper was condemned to "civil death," and from the time of Gregory of Tours (560), lazaret-houses or leper hospitals increased in number until there were about 220 in England and Scotland and 2,000 in France alone. By this process, and through the introduction of quarantine against plague by the Venetian Republic, the two most formidable pandemics were eventually stamped out. Of the deep historic significance of these applications of the Biblical code of sanitation, Sudhoff writes as follows:<sup>15</sup>

Although Greek medicine became of incomparable importance in general human progress and bases its title to fame chiefly upon the substitution of the investigation of natural ætiology for the supernatural demonic medicine, which ruled the whole of pre-Hippocratic Orient and Occident (Mediterranean and North Alpine) and still enslaves part of the world, it is a most interesting fact that, despite its theory of natural causation, Greek medicine was blind to the fact of contagion, of the direct transmission of disease. Whence so glaring a defect in the face of such keen perception of the processes of nature? Thucydides' history of the Athenian plague shows that these facts had not entirely escaped the Greeks, but Greek medicine passed them by, perhaps, because a natural explanation seemed impossible, since the populace so readily satisfied itself with the "Evil Eye" and similar imaginations.

Along the Euphrates, however, we come early upon the concept of a chronic, rarely curable disease, characterized by cutaneous changes and capable of transmission to others. Babylonian culture in fact readily drew the proper conclusion and translated knowledge into action: Those affected with this disease must be debarred from intercourse with the healthy. . . .

15. <sup>15</sup> Sudhoff: *Ann. Med. History*, N. Y., 1917-18, i, 115-117.

When leprosy fell upon the ancient world from the East, and came to the cognizance of Greek physicians, especially of Alexandria, these met its appearance with an admirable establishment of the semeiology, without penetrating deeper into epidemiological questions or recording any prophylactic measures of segregation. Egypt, where in Hellenic times leprosy spread and became established, was then its general sally port in the West and is, even today, one of its principal fields of activity. From Egypt, the disease in sluggish epidemic form traversed North Africa, crossed the strait of Gibraltar with the continuous stream of travelers, and spread over Moorish Spain; at the same time the germs were carried by the constant migrations across the Mediterranean to Italy and Southern France, across Byzantium to the Balkan and Danube states. The network became especially close over Southern Gaul, and even farther into Celtic domain, over which a Germanic stratum had been deposited; here, authentically in the sixth century, the thought of rending or cutting the threads of the epidemic which coursed over the lands was initially entertained. Enlightened princes of the church, moved by the increasing misery of the people, on the strength of the sacerdotal code of the Old Testament, undertook the task of interfering; the shepherdess of the mediæval peoples knew her duty. The Council of Lyons (583) attempted to restrict the free migration of lepers. The edict of Rotharus, King of the Lombards, demonstrates what advances this idea made in sixty years; the acts of Charlemagne, one and a half centuries later, show the same trend; the leprosy decretals of the third Lateran Council (1179) represent, in a measure, the last word of the church. Apprehension of lepers became general routine in the territories of the ecclesiastical and secular princes of France and Germany; isolation camps were established everywhere, gradually increasing to thousands. Thither the lepers and suspects were taken, the former civilly dead for the rest of life. This system was mercilessly enforced for centuries with perfect success. In this tenacious fight of centuries, the methods of which were borrowed from the Mosaic Code, the Occident triumphed over leprosy. Guided by this intellectual torch, it accomplished the first great feat in direct prophylaxis; methodical eradication of leprosy by consistently making the affected individuals harmless as carriers of the virus. Light from the East is transformed to pulsating energy by the European peoples, while the disease swings its lash unchecked in the Orient.

The same light, rising for Occidental and Mohammedan physicians alike, spent its luminosity over a second great battle, which constitutes an additional title to fame for the Middle Ages: the campaign against an acute infectious disease, which, like the destroying angel, again coursed over the Mediterranean from the Orient, the plague. Stirred by the "Black Death," which arose about the middle of the fourteenth century, the public officials of Italy and Southern France, during successive decades into the next century, with Venice and Marseilles as pioneers, created the whole system of sanitary control of incoming vessels, of observation stations, isolation hospitals and methods of disinfection. All this was adopted by modern hygiene, in more definite and rigorous form, with relatively few changes. An energetic attempt to establish order in the infected cities was made, without, however, the consistency and purposefulness of the prevention of importation. Three dates may be cited in this connection: 1374, Venice, being again threatened by importation of the plague, denied entry to the city of all infected or suspected ships, travelers and freight; 1377, Ragusa, in Dalmatia, rejected all travelers from plague districts, who had not sojourned for a month at one of two designated points, without developing the disease; 1383, Marseilles erected her first quarantine station, at which, after rigid inspection of the vessels, all travelers and cargoes from stricken or suspicious

ships were detained for forty days, exposed to air and sunshine. These are the principles of preventive medicine in the Middle Ages, created by physicians and authorities in common endeavor, in amplification of an idea called into being by the campaign against leprosy.

The various religious orders did much for sick nursing, the Benedictine monasteries were frequently provided with infirmaries, and the hospital movement initiated by Innocent III in 1198 led to the foundation of such institutions all over Europe. At first these hospitals were only retreats for the sick, infirm or indigent, but the necessity of treating syphilitics by inunction and sweating initiated the actual treatment of diseases in hospital, and there came to be hospitals for the curable (*curabiles, ergo curandi*) as well as the incurable and isolation hospitals for communicable diseases.<sup>49</sup> The pamphlet literature of plague-tracts and of directions for the personal hygiene of the nobility, or of those undertaking long journeys and sea-voyages, was enormous. The following chronology of city ordinances and hygienic manifestos, most of them exhumed by Sudhoff, shows the trend of the mediæval period in public hygiene:

- 1204 Opening of the Santo Spirito Hospital at Rome.
- 1214 Appointment of city physician at Bologna at a fixed salary.
- 1224 Edict of Frederick II regulating the practice of medicine.
- 1231 Salerno constituted a medical school by Frederick II.
- 1231 Ordinance of Frederick II against pollution of the atmosphere, adulteration of food and drugs, sale of poisons and the watering of wine.
- 1302 First judicial post mortem (Bologna).
- 1316 City surgeon at Lübeck at 16 marks per annum.
- 1350 Ordinance of city of Basel specifying "eight diseases" as contagious.
- 1357 [and later] Forensic protocols on suspected lepers.
- 1374 Ordinance of Cologne confining slaughtering of animals to city abattoir.
- 1374 Ordinance of Reggio against plague.
- 1374 Venetian Republic excludes infected and suspected ships from pratique.
- 1377 Ragusa exacts 30 days quarantine.
- 1383 Marseilles exacts 40 days quarantine.
- 1388 Parliament of Cambridge on soil pollution as a cause of disease.
- 1388 Salaried city veterinarian at Ulm.
- 1403 Venetian Republic establishes time limits of quarantine (*quaranta giorni*).
- 1409 Insane asylum at Seville.
- 1427 Ordinance of Ulm against smoky chimneys.
- 1452 Ordinance of Ratisbon regulating midwifery.
- 1464 Quarantine station established at Pisa.
- 1464-75 Tucher's *Baumeisterbuch* (against heaps of manure, disposal of sewage in streets, and requiring lanterns on street corners).
- 1494 Sebastian Brant attacks adulteration of wine, sausages, sugar and saffron.
- 1495 Syphilis first mentioned in the Edict against Blasphemers of Maximilian I.

In the writings of Arnold of Villanova (1235-1312) is included a

<sup>49</sup> Paget-Sudhoff: *Einführung in die Geschichte der Medizin*, 2. Aufl. Berlin, 1915, 188.

tract on the hygiene of troops in camp (*de regimen castru sequentium*) of date 1498:

Arnold recommends that an army should pitch its camp on level ground, away from swamps, facing east or west; that water should not be taken from springs containing slimy sticks of wood, nor from wells or cisterns containing slimy matter, nor from any part of a river in which beams of wood are immersed. To ascertain if well-water is impure, a thin, clean, piece of white linen should be dipped into it and later hung in the sunlight to dry; if spots of any color appear, such water is to be avoided. To prevent epidemics, a trench should be dug outside the camp to contain the excrements and dejecta of animals, which is to be covered again with earth, when half full. The rest of Arnold's tract is made up of mediæval prescriptions and recipes, for which reason von Töply believes it should be attributed to some other author.<sup>50</sup>

### *Introduction of Field Hospitals and Ambulances*

In mediæval Spain, military medicine was further advanced than is commonly supposed. Physicians and surgeons accompanied the Spanish armies on campaigns, and in Moorish Spain, in the thirteenth century, there were hospitals of the Arabic pattern, in which the patients were distributed according to sex and kinds of diseases, with convalescent wards, attendants and courses of medical lectures. In the chronicles of the conquest of Granada and the expulsion of the Moors by the armies of Ferdinand and Isabella, we find definite evidence of the establishment of field hospitals and ambulance service by the Queen. Six large hospital tents were in use at the siege of Alora (1484) and four at the siege of Baza (1489). Wagons provided with beds are said to have been used at the siege of Otrera (1477-8), and on the day following the capture of Malaga (August 19, 1487), some 400 of these entered the city. Through the courtesy of Drs. Edward T. Withington (Oxford) and Charles Singer (London), it is possible to give the original citations bearing upon Queen Isabella's ambulances and field hospitals:<sup>51</sup>

1. From the account of the siege of Alora (1484) by Hernando del Pulgar:<sup>52</sup>

É para curar los feridos é los dolientes, la Reyna embiaba siempre á los reales seis tiendas grandes, é las camas de ropa necesarios para los feridos y enfermos; y embiaba físicos é cirujanos é medicinas é hombres que los serviesen, é mandaba que no llevasen precio alguno, porque ella lo mandaba pagar. Y estas tiendas con todo este aparejo se llamadan en los reales el hospital de la Reyna.

For the care of the sick and wounded, the queen sent always to the camp six large tents and their furniture, together with physicians, surgeons, medicines and attendants; and commanded that they should charge nothing, for she would pay for all. In the camps, these tents with their appointments were called the Queen's Hospital.

<sup>50</sup> H. von Töply: *Die Lagerhygiene des Arnold von Villanova*. Militärarzt, Wien, 1896, xxx, 97; 113, 133; 149.

<sup>51</sup> The references and translations were first given by Dr. Withington in his *Medical History*, London, 1894, 224-225.

<sup>52</sup> Hernando del Pulgar: *Cronica de los Reyes Catolicos* (III, 33), Valencia, 1770, 230. Also given in condensed form in Prescott's *Ferdinand and Isabella*, London, 1858, I, 366.



2. From an oration held before the Pope in the Consistory at Rome by the Valentinian, Pedro Bosca (November 11, 1487):<sup>53</sup>

Sequuntur item exercitum religiosissimum, ne illi quicquid deesse possit, quadrigenti ferme<sup>54</sup> currus, operati umbraculis quod hospitale reginae appellant; in quibus impensa regia et sumptu amplissimo, quicquid curandis egrotis, sive ex acie vulneratis arte medica vel cyrurgica necessarium esse potest invenitur; honestissimis et probatissimis matronis huic muneri servientibus ad ministrantibus. Nulla scorta, nulli leones, nulla periuria, nulli denique sortium ludi in exercitu admittuntur, ne cuique pessime aut perperam agendi occasio dari valeat.

That nothing might be lacking, the most devout army was followed by about 400 ambulances, covered with awnings, which (train) was called the Queen's Hospital; in these, at the Queen's expense and in lavish outlay, was found everything necessary to the art of medicine and of surgery for the treatment of the sick or the wounded from the ranks; those attending and ministering to this duty being matrons of the most honest and trustworthy character; no prostitutes, no panders, no perjury, no games of chance were permitted in the army, lest anyone might find opportunity to behave dishonorably or improperly.

3. From the letter of Peter Martyr to the Archbishop of Milan on the siege of Baza (1489):

Hospitalia post haec tentoria quatuor ingentia, providum Reginae pietatis inventum, est operae pretium videre, ad remedium haec et medelam non sauciorum modo, sed quovis morbo laborantium erecta. Medicorum, pharmacopolarum, chirurgorumque et reliquorum ad ministeria addictorum, is est numerus, is est ordo, ea diligentia rerum ea copia, ut neque suburbano vestro Sancto Spiritu, neque vasto illi tuo Mediolanensium cedant hospitalibus. Regia impensa quicquid languoris, quicquid accidentis emergit, ni status cuique a natura dies assit absconditur.<sup>55</sup>

Four huge hospital tents, the careful provision of queenly piety, are a sight worth seeing. They are intended not only for the wounded, but for those laboring under any disease. The physicians, apothecaries, surgeons and other attendants are as numerous, the order, diligence, and supply of all things needful as complete as in your Suburban Infirmary of the Holy Spirit or your great Milan Hospital itself. Every sickness and casualty is met and provided for by the royal bounty, except where Nature's appointed day is at hand.

Queen Isabella herself visited the wounded in the field, and when some of her grandees hinted that this was contrary to Castilian etiquette, she replied:

"Let me alone. These poor people have here no other mother to lighten their sufferings. Believe me, the only consolation our neglected subjects have is the

<sup>53</sup> Pedro Bosca: Oratio Romae habita xi Kal. Novembris ad Sacrum Cardinalium Senatuum Apostolicum in celebritate victoriae Malachitanae (etc.) Rome, 1487.

<sup>54</sup> *Ferre*, from *ferre*, nearly, almost, is wrongly translated by the Spanish historians *fortalecidos* i. e., strongly fastened.

<sup>55</sup> Peter Martyr: Opus Epistolarum (No. 73), Amsterdam, 1670, 39.

presence of their sovereigns, and if these cannot give their health back to them, they may at least inspire them with the courage to bear their troublesome diseases and painful wounds with patience."

The admiring chronicler, Dr. Withington writes, concludes as follows: "Surely this queen deserved as much as those ancient Greek and Roman princesses the title *mater castrorum*."

The fall of Constantinople in the East and the end of the Hundred Years' War in the West both happened in the same year (1453), and with this date the mediæval period really closes. Queen Isabella's ambulances were harbingers of the more generous and expansive spirit of the Renaissance.

*(To be continued)*



# CRITIQUE OF THE ARMY RATION, PAST AND PRESENT

(Concluded from January 2, 1922)

BY LIEUTENANT COLONEL JOHN R. MERLIN

*Sanitary Corps, United States Army*

*Revision of Civil War Ration*

ON THE 15th of March, 1864, the Commissary General of Subsistence, Brig. General J. P. Taylor, reported to the Secretary of War that, in the opinion of his office:

1. The present army ration is larger than is necessary for the subsistence of the soldier.

2. The ration allowed prior to the passage of the Act of August 3, 1861, is sufficient for the soldier.

3. It is advisable to reduce the ration to the amount allowed prior to the passage of aforesaid act, and add the value of this reduction to the soldier's pay.

These recommendations were enacted into law June 20, 1864, with the proviso that the ration of pepper should continue as in the present ration.

This ration, put into effect by General Orders No. 226, dated July 8, 1864, reduced the energy value of the prescribed ration from 4,183 to 3,652 calories (see Table 16). But the principle of substitution on the basis of money value, which had already proved its value in adapting the available supply to the needs of the Army, was reenacted in even more explicit terms, the days of a limited dietary imposed by law upon soldiers, as if they had been prisoners, having long since passed. Moreover, foraging throughout the Civil War, and notably in 1864, during Sherman's famous march to the sea, was more or less connived at, and the nourishment a soldier obtained was to a degree his own lookout. There was not yet an adequate messing system to guarantee proper nutrition, nor was there an organized system of inspection of supplies, the need for which was so painfully learned in the next war.

## THE SPANISH-AMERICAN WAR

If the colonial period of rationing the Army may be characterized as the *starvation period* because of actual want of supplies, and the wars of 1812 and 1861, on account of the occurrence of scurvy, as the *deficiency period*, the Spanish-American War, because of ignorance or neglect of the laws of nutrition, might well be designated as the *toxic period*, not so much because a large number of soldiers were *actually* poisoned by the so-called "embalmed beef" as because the danger of it was certainly present through lack of adequate inspection of manufactured foods.

The packing industry had grown up since the Civil War. The canning of milk, to be sure, had originated during the Civil War itself but had not influenced the problems of supply, because milk was not a recognized component of the ration. By 1898, however, all sorts of provisions were available in tins, and since in this form they are more easily handled and transported, it was but natural that the Commissary Department, as it was still called at that time, should place orders for large amounts of them.

The ration in force in 1898 was essentially the same as in the Civil War so far as its chief components were concerned, but an even broader system of substitution had been adopted. Moreover, as the law of 1874 had provided, it was expressly recognized by Congress that "The President may make such alterations in the component parts of the ration as a due regard to the health and comfort of the army and economy may require."<sup>52</sup> By General Orders No. 59, 1878, a special travel ration, consisting of canned uncured or corned beef and of canned baked beans and cheese, was authorized for troops traveling on cars or otherwise when it was impracticable to cook their rations.

It was really this travel ration, with the substitution of canned "roast" beef for canned corned beef, that gave cause for the "embalmed beef" scandal of unpleasant memory. In the investigation of the food furnished to troops in Cuba which was made under the authority of the U. S. Senate in the year following the war, the proceedings of which have been published in three large volumes, may be found abundant evidence of poor dietary management. Medical officers who inspected the transports in the harbor at Tampa, whence they were to sail to Santiago, testified that the men were throwing away their rations because they could not eat them. "They had been on board the transports for weeks and living on this canned stuff—canned beans, canned beef, hard bread, sugar and coffee, which is the travel ration, I believe." . . . "And they were becoming cloyed with this ration and they didn't eat it."

As soon as the men were ashore (in Cuba) and as soon as the transports could be reached, the regular field ration took the place of the travel ration. That was the hard tack and bacon. . . .

After the surrender of Santiago, refrigerator beef was brought up. . . . With the exception of one-quarter of this beef, delivered late in the day, the beef was good.<sup>53</sup>

Whether the canned roast beef was actually toxic has never been

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<sup>52</sup> Revised Statutes, Sec. 1116.

<sup>53</sup> Maj. Henry Killbourne, Chief Medical Officer, Fifth Army, "Food Furnished to Troops in Cuba," Vol. ii, p. 1284.

proved scientifically, but there is no doubt that it made many men very ill. On this topic both medical and line officers agree. One or two quotations will suffice:

It became repulsive to them (the wounded at Siboney) in a very short time and quite a good many men complained that it gave them intestinal trouble and diarrhea.<sup>54</sup>

I ate it or tried to eat it for two days and I had diarrhea for the whole time.<sup>55</sup>

The men absolutely refused to eat it. The meat could not be disguised even in hash so that they would not recognize it.<sup>56</sup>

I told them that this meat . . . had escaped proper inspection—that the inspection had not been thorough enough.<sup>57</sup>

For lack of suitable inspection the Commissary Department of the army was given boiled soup meat in cans for what it supposed was canned roast beef.<sup>58</sup>

But for this unfortunate adoption of a poorly selected, poorly inspected and probably poorly processed canned product as a substitute for corned beef in the travel ration, the feeding of troops in the Spanish-American War would have marked a considerable advance over previous wars, for the regular garrison ration used in camps was unquestionably a better ration than had previously been employed. One regiment, the 2d Pennsylvania Volunteers, which for the entire emergency was on guard duty in New Jersey, had a remarkably low sick rate, and amongst the causes to which its good fortune was ascribed is the following:

*Fourth*, the food furnished the men was the regular government ration. It was of excellent quality and ample in amount. It was regularly subjected to a rigid inspection whenever an issue of fresh beef, vegetables, etc., was made.<sup>59</sup>

Further details regarding the rationing in training camps are given in the following report from the surgeon of an Iowa regiment which was stationed successively in four different camps:

The rations in Camp Cuba Libre were good in quality and ample in quantity. Perhaps for a southern camp (Florida) in the heat of summer, the light drills and very little labor, the rations contained too large a proportion of nutritive material and not enough of the fruit acids. . . . The exceptions to the good quality of the rations were the canned meats and fish and at times the beans. . . . The canned meats were often refused by the men, and the beans were at times such that

<sup>54</sup> Capt. M. W. Ireland, *ibid.*, ii, 1280.

<sup>55</sup> Col. H. L. Turner, *ibid.*, i, 372.

<sup>56</sup> Capt. D. H. Boughtain, 3d Cavalry, *ibid.*, i, p. 367.

<sup>57</sup> Lieut. Col. A. D. Smith, *ibid.*, i, p. 347.

<sup>58</sup> Testimony of Dr. M. S. Devoe, Chief Inspector of Bureau of Animal Industry, before investigating committee, March 11, 1899.

<sup>59</sup> Lieut. F. R. Packard, Asst. Surg., 2d Pn. Vol. Inf., "A Healthy Regiment and Why It Was So." Charlotte, N. C., Med. Journ., 1898, xiii, p. 545.

they could not be softened (!) even by cooking. The fresh beef (refrigerator beef) was usually excellent, though there were some cases of ptomaine poisoning in the division camp resulting from the beef eaten.

There was at times a long delay before the meat was cooked after it was removed from the refrigerator cars, and such beef quickly underwent deleterious changes. It was inspected by the regimental surgeons in the 49th Regiment and, when unfit for use, was condemned.

There were about the camps numerous sutler stands, and the men ate and drank freely at these. There was no rigid effort made to compel the men to adhere to the army ration. In fact, many captains used freely a contributed company fund to supply large additions to the diet. This, in so far as fruit was concerned, was an advantage. This contributed fund was necessary if extra articles were to be had, since I am told no savings of any consequence by the company commissary were possible.

The army ration drawn by regimental commissary officers, and without advice from the surgeons of the army, was as follows: Meats, 70 per cent fresh beef; bacon, 20 per cent; salmon, 10 per cent; bread, 80 per cent flour; brown bread, 20 per cent; vegetables, 50 per cent beans; rice, 50 per cent; potatoes, 80 per cent; onions, 10 per cent; tomatoes, 10 per cent; coffee, 100 per cent; sugar, 100 per cent; seasoning, 100 per cent.

This made the daily ration of a man as follows:

Fresh beef 14 oz.; bacon 2.4 oz.; salmon 1.8 oz.; flour 14.4 oz.; hard bread 3.2 oz.; beans 1.2 oz.; rice 0.8 oz.; potatoes 11.2 oz.; onions 2.4 oz.; tomatoes 2.4 oz.; coffee 1.6 oz.; sugar 2.4 oz.; vinegar 1.3 oz.; salt 0.64 oz.; pepper 0.04 oz.

The companies from private funds and with the board money of the officers added to the above rations: milk, butter, eggs, cabbage, oatmeal, prunes, lemons, and other fresh and canned fruits. The men with their individual funds bought pies, canned meats, jams, jellies, fruits, ice cream and acid drinks. There was at no time a canteen in the 49th Regiment, and no alcoholic drinks were sold within the camp.

A few of the plainer actual menus of the company meals are here given to show the daily diet. These are chosen at random from different companies at a time when there were few additions to the regularly issued rations.

(1)

*Breakfast.*—Hash, bread, coffee, sugar.

*Dinner.*—Roast beef, beans, bread, coffee, sugar.

*Supper.*—Rice and milk, beef, beef tea, bread, coffee, sugar.

(2)

*Breakfast.*—Bacon, hash, oatmeal, bread, coffee sugar.

*Dinner.*—Salmon, boiled potatoes, gravy, bread, coffee, sugar.

*Supper.*—Cold beef, salmon, tomatoes, beans, bread, coffee, sugar.

The absence of fruit in the above is certainly a fault. Puddings, pies, and other extras were occasionally served by the company cooks. It will be observed that the foods are not so combined as to give a well-

balanced diet of proteids and carbohydrates because in most instances the cook knew nothing at all of the different uses of foods in the animal economy.

Each company had a chief and two assistant cooks. The chief cook ranked as a corporal and received a corporal's pay with, it is believed, an additional 25 to 50c. a day paid from the company fund. . . . The corporal cook was usually a man of some experience in hotels, etc.

The higher nutritive value of the ration actually issued in the concentration camps in 1898, as compared with previous wars, resulted from the more liberal policy of substitution, and from the savings principle which permitted still wider latitude in the choice of foods. Instead of a pound of fresh potatoes three times a week, which was authorized in the ration of '61, a pound a day now became the basis of the vegetable component.

In Section 8 of the law of April 14, 1818, Congress had conferred upon the President authority to make general changes in the ration. In 1838 the President had exercised this authority to substitute coffee and sugar for whiskey. In 1862 it had been exercised again to add a vegetable component. In 1878, in Section 1146 of the revised statutes, it is specifically provided that "the President may make such alterations in the component parts of the ration as a regard to the health and comfort of the army may require." The wisdom of this provision is abundantly confirmed, notwithstanding the baneful effect of the canned-beef episode, by the fact that during the Spanish-American War no scurvy or other deficiency disease was reported. In addition, it is certain from present knowledge that the ration, as eaten in the concentration camps at least, was better balanced with respect to both organic and mineral constituents. The computation of energy distribution, based upon the components alone, as shown in the table, does not exhibit this improvement.

The travel ration at its best was much too heavy in protein (see Table 16), and it is doubtful whether the soldier, exposed as he was in the Santiago campaign to a tropical climate, would have continued in good health upon such a ration even if its bacteriological character had been above reproach.

It will be noted that butter had not reappeared as a regular component since the winter ration of 1775. As a consequence, the prescribed ration continued low in percentage of fat until we reach the emergency ration authorized in General Orders No. 49 in 1896, which, consisting principally of bacon and hard tack, became the basis of the field ration of 1898. This ration, with half its energy in the form of pork fat, may be severely criticized also on the score of improper balance

of nutrients, especially for a tropical or subtropical climate. Such a ration would ruin the digestion of any human being except an Esquimo, if persisted in for any considerable length of time. Its sole merit lay in its portability. The fact that soldiers do survive the use of such a ration for a few days is no argument in its favor. They would also survive, in fact, often have survived, complete starvation for an equal length of time. In practice, however, in field operations, where the individual soldier was supposed to do his own cooking, a large part of the fat was rendered out in the process of frying and was thrown away. A crisp crackling containing only a fraction of the original fat, therefore, was the meat actually eaten, if any. In Cuba many of the volunteer soldiers subsisted on hard tack and coffee alone rather than eat the meat component.<sup>60</sup>

The canned tomato component of the army ration as actually issued regularly in camp, and "when possible" in the field, deserves a paragraph by itself. It makes its first appearance in the conflict which gave us our greatest food scandal, the Spanish-American War. The officer responsible for the introduction of this article deserves to be memorialized, even if he were "wiser than he knew," for it turns out that canned tomatoes retain for at least two years,<sup>61</sup> and for a long time also when dried,<sup>62</sup> a very powerful antiscorbutic property. Apparently, this persistence of a vitamine in a preserved food is due to the malic acid present. However this may be, its value must now be recognized as something more than flavor, valuable as that is. Indeed, it will not be surprising to find that other "mere flavors" signalize the presence of nutrient properties of truly physiological, as opposed to psychological, importance. Tomatoes, moreover, in spite of their organic acidity, contribute, as do most other fresh vegetables, a basic ash which helps to balance the inorganic acidity of meats and cereals.

#### IMPROVEMENTS IN THE RATION AFTER 1898

As a military performance, including rationing of the Army, the Spanish-American War invited bitter criticism. There was an extended investigation by Congress of the defects and deficiencies in the food. A reorganization of the Army followed, and the act approved February 2, 1901, entitled "An act to increase the efficiency of the permanent military establishment of the United States," brought many improvements. For example, it was provided that "the President is hereby

<sup>60</sup> E. G. Brackett: "Work of the Massachusetts Volunteer Aid Association in Santiago," *Bos. M. and S. J.*, 1899, cxl, p. 81.

<sup>61</sup> Givens and McClugage: "Unpublished Observations"; also Hess and Unger: "Canned Tomatoes as an Antiscorbutic," *Proc. Soc. Exp. Biol. and Med.*, 1918, xv, p. 96.

<sup>62</sup> Givens and McClugage: "An Experimental Study of Raw and Dried Tomatoes," *Journ. of Biol. Chem.*, 1919, xxxvii, p. 253.



authorized to prescribe the kinds and quantities of the component articles of the army ration and to direct the issue of substitutive equivalent articles in place of any such components whenever, in his opinion, economy and regard to the health and comfort of troops may so require . . . .<sup>63</sup> For President read Secretary of War and for Secretary of War read Commissary General, and we have the actual effect of this section; for, obviously, neither the President nor the Secretary of War attends to these matters in person. It will be noted that this enactment is broader than the one adopted in 1878, quoted on page 194. There was no longer any excuse for not providing the troops whatever foods were available or, still better, whatever the commanding officers determined was good for them.

In 1900 a board of officers had been convened to consider the ration best suited for the use of troops in tropical climates. The proceedings of this board were referred for remark to Surgeon General Sternberg, who replied as follows:

#### *4th Endorsement*

June 4, 1900. Resp'y returned to the A. G. of the Army. In my opinion the principle on which our present Army Ration is based is correct. The Subsistence Dept. to provide certain staple articles of food in quantity sufficient for the needs of the troops under the most severe tests of hard work and climatic exposures, the said articles having a money value which will enable company commanders and others responsible for the messing of the men to vary the diet when needful by purchase from the Subsistence Dept. or sometimes from outside sources. The articles selected for issue and the quantities allowed have been the result of many years of experience both in time of peace and in time of war. The board therefore makes no suggestions looking to a radical departure from present methods.

This recognition of a joint responsibility on the part of the Medical Department was at this time limited to an advisory capacity and had reference to "food and its variety from a medical point of view."

The garrison ration was revised, in accordance with the principles enunciated by the Surgeon General in the indorsement quoted, through an executive order dated March 26, 1901. The only material change over the 1898 ration consisted in the addition of prunes as a dried fruit component, and an increase of the sugar component. The energy value was raised by 55 calories (see Table 16).

The field ration was materially changed. The Santiago campaign had demonstrated that it was possible with suitable precautions to issue refrigerated beef to troops in actual campaign. Fresh meats, therefore,

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<sup>63</sup> Sec. 40, Act of February 2, 1901 (31 Stat. L., 753).

replaced bacon; flour or soft bread replaced hard bread, beans and fresh vegetables were continued and jam was adopted as a fruit component.

The emergency ration of 1896 was retained in slightly modified form as the "haversack ration."

The travel ration was improved by the use of soft bread instead of hard, corned beef instead of canned beef, the issue of canned tomatoes every day instead of every fourth day, and the addition of evaporated milk and jam. This is the first appearance of milk as a component in any U. S. Army ration.

#### THE RATION OF 1908

In 1906 and 1907, a considerable amount of discussion of the army ration is found in official correspondence, the drift of which may be indicated by the following indorsement from Surgeon General O'Reilly to the Commissary General:

War Department, S. G. O.,  
Washington,  
November 14, 1907.

Respectfully forwarded to the Commissary General.

The present Army Garrison Ration has been shown to contain in sufficient quantity all the nutritive principles necessary for the soldier at hard labor. From a practical point of view, however, it seems to have been equally well demonstrated that it does not satisfy the average soldier, and that additions to it from other sources must constantly be made.

It is believed that the ration should be sufficient in itself without any addition from other sources.

(Signed) R. M. O'R.,  
S. G., U. S. A.

By executive order dated April 2, 1908, and published in General Orders No. 46, W. D., the several rations were again revised to go into effect May 1, 1908. Department commanders and other commanding officers were invited to comment after trial as to their suitability. The principal additions to the garrison ration were: Milk, evaporated and unsweetened, 0.5 ounce; lard, 0.64 ounce; butter, 0.5 ounce; and syrup, 0.32 gill. The energy value in consequence was augmented by over 400 calories. The field ration was increased only by the addition of 0.5 ounce evaporated milk. Some comments<sup>64</sup> of officers follow:

Report of Chief Commissary, Headquarters Department of the Lakes. Comments from Company Commanders.

"Fifty per cent or less of flour, dried fruits, spice and syrup were consumed. Large amounts were expended from company funds for vegetables, milk, and butter. . . . Fresh pork might be substituted

<sup>64</sup> Quoted from official correspondence in letter file in charge of Mr. Rogers, Room 424, War Department, December, 1917.

for mutton on the basis of quantities actually consumed of these meats.

"The garrison ration should be issued both in garrison and in the field except when it is impossible to cook or carry cooked rations, in which case the travel ration should be issued.

"The haversack or emergency ration should never be issued except in cases of absolute necessity. Butter and milk components should be double. Canned milk, canned butter, and canned syrup can be easily transported, and the necessity for butter and milk is greater because they are generally unobtainable in the field. . . . Three-quarters of the syrup should be changed to something else. Cheese should be added. . . . The regular garrison ration should be issued in the field. The vegetable ration should be increased and green vegetables at times substituted for a certain percentage of potatoes. Fresh onions and potatoes are invariably required in excess of the ration. Milk and butter are insufficient in quantity."

Report of Chief Commissary. Headquarters Department of the Gulf.

"The allowance of butter and milk should be increased to one ounce each per ration. . . . Baking powder, cinnamon, and lemon extract and other substitutes should be eliminated and the butter allowance doubled. . . . Of dried fruit 24-25 oz. instead of 1.28 oz. is sufficient. The quantity of syrup should be reduced 50 per cent. In season fresh fruits should be substituted for dried fruits. Three times the amount of milk and butter should be issued. One-eighth of the vegetable ration should be issued in canned form and canned peas for use in making soup. A better grade of syrup should be issued. Breakfast bacon should be substituted for the present grade which is too fat. . . .

Headquarters Department of California.

"The new ration permits increased savings. Butter and milk should be doubled, and syrup decreased or discontinued. The issue of single rations should be discontinued and money allowance substituted therefor."

Headquarters Department of Dakota.

"The new ration is satisfactory except that butter and milk should be increased to one ounce, and lard decreased to half an ounce per ration. The greatest savings were made on flour, beef, potatoes, lard, beans, prunes, and coffee, in the order named."

Headquarters Department of the East, Office of Chief Commissary.

"Garrison ration: The ration is accurate and satisfactory as to kind, quality, and variety. The value of the beef can be increased by buying beef hearts or livers. The beef allowance is just sufficient. The flour allowance could be reduced from 18 to 16 ounces. Of baking powder .08 of an ounce is not nearly sufficient, and should be packed in 5 lb. tins instead of  $\frac{1}{2}$  lb. tins to save the cost of containers. 2.4 ounces of beans is not sufficient, and should be increased to 4 ounces. The potato allowance, 20 ounces, is sufficient, if potatoes are of medium size and sound. The 10 per cent of onions is sufficient. . . . Fresh vegetables should not be reduced. The allowance of prunes, 1.28 ounces, is sufficient, as is also the allowance of coffee, 1.12 ounces. Money can be saved by substituting tea or cocoa for part of the coffee.

Sugar, 3.2 ounces, is insufficient. It should be increased to 4 ounces. Milk 0.5 ounce is insufficient, and should be about 0.8 ounce . . . vinegar, salt, pepper, and cinnamon are sufficient. Lard is excessive in quantity and substitution of compound is recommended. Butter is insufficient in quantity and should be used only on the table. A good grade of oleomargarine should be substituted for butter. A better grade of syrup would be more satisfactory. The flavoring extract allowance is sufficient. In general, the canned component should be bought in larger packages."

"Major Kranthoff recommends substitution of 'service ration' for garrison ration in the elimination of substitute articles, because only small quantities have been used in the manoeuvres; elimination of certain articles such as spice, lard, butter, oleomargarine, syrup, and flavoring extracts, and the increase of certain articles. The forced consumption of certain proportions is recommended."

The important changes recommended, each of them mentioned by a number of different officers, are summarized as follows:

1. Flour, meat, syrup, dried fruit, lard and spices should be reduced.
2. Vegetables, beans, milk and butter should be increased.

Notwithstanding these recommendations, the rations continued in effect and were confirmed by Act of Congress dated January 11, 1911. It is difficult to understand why the matter was referred to Congress, since the power of the executive to make such changes as he might deem necessary was not disturbed.

Later, the Quartermaster General recommended that "the Army Regulations be amended to permit organizations to make a saving on the ration of not over 30 per cent at maneuver and concentration camps, because it was found that issue in kind at mobilization and concentration camps did not afford sufficient variety." The War College Division did not concur in this recommendation and ascribed the lack of variety in the diet to inexperienced officers, to untrained and undisciplined mess sergeants and cooks, and to difficulty in obtaining supplies promptly.

#### RATIONS IN USE AT OUTSET OF THE WORLD WAR

The rations of 1908, confirmed in 1911, were in force during the Mexican mobilization in 1912, the volunteer training camps of 1914, '15 and '16, and the punitive expedition into Mexico in 1916, and in 1917 when the United States entered the World War. Only one or two slight changes had been made. For example, in 1911, lard compound or, as it was later called, "lard substitute," was introduced in place of lard; this was a frying fat made largely from vegetable oils and therefore very

much cheaper than pure lard. In the meantime, also, several emergency rations had been experimented with, and one of them, the so-called "chocolate ration," approved March 10, 1913, had been found so unsatisfactory in the Mexican punitive expedition that it was definitely abandoned. Another, the so-called "bread and meat" ration, had been tried with more success and in 1918 was called for by General Pershing. It was revised slightly and was manufactured in large quantity for use in France.

It is too early to comment upon the use of these emergency rations further than to say that *they violate most of the significant principles of nutrition* which have been discovered within the past fifty years. It is certain, for example, that a man cannot eat a sufficient amount of them to maintain himself in an equilibrium of substance, that if kept upon such a diet for a few days his stomach would usually revolt, and that if it did not, in the course of a few weeks he would show signs of scurvy and possibly of xerophthalmia. If an emergency ration is really desirable, a successful one can only be developed by attention to the results of animal experimentation.

#### LANDING RATION

The first new ration, resulting from the previously untried conditions in the World War, was the landing ration or debarkation ration provided to meet the need of troops going to France via England. Apparently, this ration was used only upon a small number of transports; for most of the troops were carried on English transports,<sup>65</sup> and were fed upon an English scale of rationing. Those carried upon U. S. naval transports were fed the navy ration.

#### THE RED CROSS RATION FOR AMERICAN PRISONERS OF WAR

A ration of this designation was worked out by the Division of Food and Nutrition at the request of the American Red Cross in September, 1917, and was immediately approved by that organization. For some reason, however, it was never officially adopted by the War Department, and when, in the early autumn of 1918, complaints regarding the ration received through Red Cross channels by American prisoners reached Washington, it was discovered that the ration complained of was one of entirely different composition from that devised by the Division of Food and Nutrition. As a matter of record the ration devised by the Medical Department in 1917 is here reproduced.

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<sup>65</sup> For further information see Lieutenant Colonel Carlson's report upon his work in England. Volume upon Laboratories Division, A. E. F.

TABLE 17.—*American Red Cross Prisoners' Ration as Originally Devised by Division of Food and Nutrition. Never put into use.*

Component	Weight avoird. ounces	Weight, metric grams	Per cent protein	Per cent fat	Per cent carbo- hydrate	Gms. pro- tein	Gms. fat	Gms. carbo- hydrate
Rice <sup>1</sup> .....	8	226	8.0	0.3	79.0	18	1	179
Sugar.....	12	340	.....	.....	100.0	.....	.....	340
Dried beef <sup>2</sup> .....	10	283	26.4	6.9	.....	75	20	.....
Pork and beans.....	32	906	6.9	2.5	17.1	63	23	155
Peanut butter.....	8	226	29.3	46.5	17.1	66	105	39
Crackers, soda <sup>3</sup> .....	44	1,245	9.8	9.1	72.8	122	113	906
Evaporated milk.....	3	85	8.8	8.3	54.1	7	7	46
Coffee <sup>4</sup> .....	5	142	.....	.....	.....	.....	.....	.....
Salt and pepper.....	2	57	.....	.....	.....	.....	.....	.....
Milk chocolate.....	4	113	8.7	32.0	56.6	10	36	64
Desiccated strawberries <sup>5</sup> .....	2	57	9.6	6.4	60.0	5	4	34
Jam <sup>6</sup> .....	8	226	0.6	0.1	84.5	1	.....	191
Nut margarine <sup>7</sup> .....	3	85	1.2	83.0	.....	1	71	.....
Dried figs <sup>8</sup> .....	3	85	4.3	0.3	74.2	4	.....	63
Soap.....	3	85	.....	.....	.....	.....	.....	.....
Cigarette making <sup>9</sup> .....	2	packages of "Bull Durham"	.....	.....	.....	.....	.....	.....
Totals <sup>10</sup> .....	150	4,256 <sup>11</sup>	.....	.....	.....	372	380	2,017

<sup>1</sup> 13,092 calories in total package; sufficient for four days (5 days if not working).

<sup>2</sup> Grams per day, protein 93; fat 95; carbohydrate 501. Heat from protein 11.7 per cent of total.

<sup>3</sup> Hominy, weight for weight, may be substituted for rice.

<sup>4</sup> Corned beef may be substituted for dried beef on basis of 61 per cent of dried beef weight.

<sup>5</sup> Weight for weight, all varieties of plain crackers may be substituted.

<sup>6</sup> Tea, to extent of 25 per cent weight of coffee, may be substituted.

<sup>7</sup> Desiccated strawberries, raspberries, blackberries, interchangeable, weight for weight.

<sup>8</sup> All kinds of jam interchangeable weight for weight.

<sup>9</sup> Oleo may be substituted weight for weight.

<sup>10</sup> Dates may be substituted weight for weight; apples on basis of 120 per cent, apricots 120 per cent, pears 110 per cent, prunes 130 per cent.

<sup>11</sup> Cigars, pipes, etc., may be substituted.

When reports from the American prisoners' camps were received, it was realized that the purpose of this ration had not been correctly apprehended, either by the American Office of the Red Cross or by the Division of Food and Nutrition, which was responsible for its composition. For example, it was not intended as complete sustenance for prisoners at work. However, as the ration shown in Table 17 was never used, no harm resulted. The ration actually used, and later objected to, was adopted by the Red Cross representatives in Europe after consultation with the British Red Cross, and was approved by the Food and Nutrition Section in the office of the Chief Surgeon, A. E. F.

Complaints received indicated displeasure on the part of the American prisoners because of the heavy proportion of meats and the lack of

appetizing vegetables and fruits. When the request for a revision was received it was placed in the hands of Maj. R. D. Milner, then on duty in the office of the Surgeon General, and the form in which it was submitted by the Surgeon General on October 26, 1918, and adopted on November 6, 1918, was worked out in his office. It should be understood clearly that this ration was intended for shipment in 5 kilo parcels through Red Cross channels, and therefore was subject to the limitations of such conditions, as well as those of restrictions in kinds of food available (see Table 16).

About January 1, 1918, the Division of Food and Nutrition received a request from the American Red Cross for a ration subject to the same limitations as the ration just discussed, but adapted to the needs of American prisoners ill in enemy detention camps. It was, of course, impossible to devise a ration which should meet the requirements of every sort of illness. Nevertheless, the ration shown below was submitted in the hope that it might more nearly satisfy the moderate appetite of sick soldiers than would the full ration which had been submitted earlier.

#### THE PROPOSED TRAINING RATION

The nutritional surveys which have been described in the preceding chapter of this report were calculated to exhibit, not only the actual average amount of food consumed, but also the average amounts of various articles composing the diet as actually selected. When, early in 1918, 227 messes had been reported upon, the average amount of each article supplied, whether by the Quartermaster or by outside purchase, was carefully reckoned up. It was seen at once that the ration as actually selected represented a wide departure in certain respects from the prescribed ration, and in the conviction that the unrestricted taste of the soldier was a fairly safe index of desirable alterations, particularly as they coincided with alterations indicated by the experience of many officers who reported upon the 1908 ration and agreed also with alterations dictated by the newer discoveries in the science of nutrition, a revision was proposed by letter of the Surgeon General addressed to The Adjutant General under date of June 3, 1918. The extent of the changes proposed may be gathered from Table 19, which exhibits in parallel columns the garrison ration as it was supposed to be computed under the provisions of paragraph 1221, Army Regulations, the food actually supplied to 227 messes, and the proposed "training ration."

TABLE 13.—*American Red Cross Invalid Ration*

Component	Amount ounces	Container (Full directions for use must be printed on each package.)	Alternative	Amount ounces	Container (Full directions for use must be printed on each package.)
Potted chicken	2 0	4 oz. tin cans	Potted beef or veal	2 0	4 oz. tin cans.
			Dried beef (not salted)	3 0	4 oz. wax cart.
			Beef tongue (whole, canned)	2 0	4 oz. tin cans.
			Salmon, canned	2 5	4 oz. tin cans
			Eggs, dried	3 3	8 oz. wax cart.
Potatoes, dehydrated	1 2	16 oz. wax cartons	Cheese, American Pale	1 2	1 oz. wax cart.
			Rice	1 2	8 oz. wax cart.
			Macaroni	1 2	8 oz. wax cart.
Cracker, any kind	8 0	8 oz. wax cartons	Hominy Grits	1 2	8 oz. wax cart.
Oil or meat fat with 10 per cent butter fat	1 0	8 oz. wax cartons	Zwiebach	8 0	8 oz. wax cart.
			Nut margarine	1 0	8 oz. wax cart.
			Peanut butter	1 2	8 oz. wax cart.
Soup compressed, e. g., "Julienne"	1 2	16 oz. wax cartons			
Spinach, dehydrated	0 5	8 oz. wax cartons	Tomato, dehydrated	0 5	8 oz. wax cart.
Oatmeal, steamed	0 8	8 oz. wax cartons	Farina	0 8	8 oz. wax cart.
			Barley	0 8	8 oz. wax cart.
Sugar	2 0	8 oz. cartons	Syrup, corn	2 5	8 oz. tin cans.
			Honey	2 5	8 oz. tin cans.
			(May replace sugar to extent of 50 per cent.)		
Milk powder	2 0	8 oz. tin cans	Fresh milk	16 0	8 oz. tin cans
Prepared corn starch pudding	0 3	8 oz. wax cartons	Malted milk powder	2 0	8 oz. tin cans
			Prepared tapioca pudding	0 8	8 oz. wax cart.
			Prepared sago pudding	0 8	8 oz. wax cart.
Dried apples	1 0	8 oz. wax cartons	Gelatine preparation	0 8	8 oz. wax cart.
			Dried apricots, prunes	1 0	8 oz. wax cart.
			Peaches	1 0	8 oz. wax cart.
			Figs or dates	0 8	8 oz. wax cart.
			Fresh fruit (apples, oranges or lemons)	5 0	...
			Jam or marmalade	1 0	8 oz. tin cans.
Chocolate, sweet	1 0	1 oz. cake	Cocoa	0 3	4 oz. tin cans.
Beef extract	0 2	2 oz. jars	Bouillon cubes	0 2	2 oz. jars
Coffee, soluble	0 4	4 oz. tin cans	Tea	0 4	2 oz. tin cans.
Bean	0 3	1 oz. wax cartons	Agar agar	0 2	1 oz. wax cart.
Salt	0 7	4 oz. wax cartons			
Pepper	0 04	1 oz. box			



TABLE 19

Food article	Garrison ration as per A. R. 1221		Food actually supplied in 227 messes		Proposed training ration		
	Com- ponent articles	Substi- tutive articles	Com- ponent articles	Substi- tutive articles	Com- ponent articles	Substitutive articles on basis of	
	Ounces	Ounces	Ounces	Ounces	Ounces	Energy Ounces	Protein Ounces
Beef, fresh	14 0		9 15		12 0		
Mutton						9 07	14 5
Veal				0 26		20 7	10 3
Pork, fresh				0 83		9 8	12 9
Poultry				0 27		13 1	12 6
Fish, fresh (salmon)				0 30		18 1	10 8
Fish, fresh (cod)						73 4	22 4
Fish, preserved				0 27		23 2	8 3
Corned beef (canned)						14 7	7 2
Hash, corned beef				0 19		22 7	13 2
Liver				0 24		21 9	9 3
Total beef, etc.	14 0		9 15	2 36	12 0		
Total beef, etc.		14 0		11 51		12 0	
Bacon		3 6		0 50	2 0		
Ham			0 72			3 7	1 3
Sausage			0 91			4 7	0 9
Total bacon, etc.		3 6	0 50	1 68	2 0		
Total bacon, etc.		3 6		2 16		2 0	
Flour	18 0		1 87		10 0		
Bread, soft				7 98		10 67*	10 96
Bread, hard				0 02		9 22	10 00
Total flour, etc.	18 0		1 87	8 0	10 0		
Total flour, etc.		18 0		9 87		10 00	
Other cereals (oatmeal)			0 40		1 5		
Cornmeal				0 48		1 68	2 70
Farina				0 37		1 63	2 50
Total other cereals			0 40	0 85	1 5		
Total other cereals				1 25		1 5	
Baking powder	0 08				0 08		
Beans, dried	1 2		1 01		2 25		
Beans, baked, canned						6 02	7 34
Peas, dried						2 18	2 06
Corn, canned				0 58		7 91	18 05
Total beans, etc.	1 2		1 0	1 40	2 25		
Total beans, etc.		1 2		2 41		2 25	
Rice		0 8	0 45		1 0		
Hominy, dry				0 30		1 00	1 04
Macaroni and spaghetti				0 22		0 98	0 61
Corn starch						0 97	
Total rice, etc.		0 8	0 45	0 52	1 0		
Total rice, etc.		0 8		0 97		1 0	

\* One two-pound loaf for each three men.

TABLE 19—Continued

Food article	Garrison ration as per A. R. 1221		Food actually supplied in 227 messes		Proposed training ration		
	Component articles	Substitutive articles	Component articles	Substitutive articles	Component articles	Substitutive articles on basis of	
						Energy ounces	Protein ounces
Potatoes, white .....	14 0	.....	11 71	.....	14 0	.....	.....
Potatoes, sweet .....	.....	.....	.....	0 77	.....	9 43	18 00
Potatoes, dehydrated .....	.....	.....	.....	.....	.....	2 72	2 77
Potatoes, sweet, dehydrated .....	.....	.....	.....	.....	.....	2 63	4 85
Total potatoes .....	14 0	.....	11 71	0 77	14 0	.....	.....
Total potatoes .....	.....	14 0	.....	12 51	.....	14 00	.....
Onions, fresh .....	.....	4 0	0 71	.....	4 0	.....	.....
Onions, dehydrated .....	.....	.....	.....	.....	.....	0 48	.....
Cabbage, fresh .....	.....	.....	.....	1 11	.....	6 41	.....
Cabbage, dehydrated .....	.....	.....	.....	.....	.....	0 52	.....
Beets, fresh .....	.....	.....	.....	0 09	.....	4 63	.....
Beets, dehydrated .....	.....	.....	.....	.....	.....	0 51	.....
Carrots, fresh .....	.....	.....	.....	0 14	.....	4 86	.....
Carrots, dehydrated .....	.....	.....	.....	.....	.....	0 49	.....
Spinach, fresh .....	.....	.....	.....	0 21	.....	7 07	.....
Spinach, dehydrated .....	.....	.....	.....	.....	.....	0 61	.....
Turnips, fresh .....	.....	.....	.....	0 35	.....	6 24	.....
Turnips, dehydrated .....	.....	.....	.....	.....	.....	0 50	.....
Total onions, etc. ....	.....	4 0	0 71	1 90	4 0	.....	.....
Total onions, etc. ....	.....	4 0	.....	2 61	.....	4 0	.....
Tomatoes, canned .....	.....	2 0	1 41	.....	2 0	.....	.....
Tomatoes, dehydrated .....	.....	.....	.....	.....	.....	0 13	.....
Total tomatoes .....	.....	2 0	1 41	.....	2 0	.....	.....
Total tomatoes .....	.....	2 0	.....	1 41	.....	2 0	.....
Prunes .....	0 38	.....	0 40	.....	0 5	.....	.....
Apples, evap .....	.....	0 13	0 13	.....	0 25	.....	.....
Peaches, evap .....	.....	0 13	0 21	.....	0 25	.....	.....
or pears, evap .....	.....	.....	.....	.....	.....	0 27	.....
or apricots .....	.....	.....	.....	.....	.....	0 25	.....
or raisins and currants .....	.....	.....	.....	0 13	.....	0 22	.....
Jam .....	.....	0 64	0 58	.....	0 60	.....	.....
Total prunes, etc. ....	0 38	0 90	1 32	0 13	1 60	.....	.....
Total prunes, etc. ....	.....	1 28	.....	1 45	.....	1 60	.....
Fresh fruits equivalent to 1 6 oz preserved .....	.....	.....	.....	.....	.....	.....	.....
Fruits .....	.....	.....	.....	.....	.....	.....	.....
Apples .....	.....	.....	.....	.....	.....	8 79	.....
Peaches .....	.....	.....	.....	.....	.....	12 48	.....
Pears .....	.....	.....	.....	.....	.....	7 41	.....
Pineapple, canned .....	.....	.....	.....	0 49	.....	2 70	.....
Oranges .....	.....	.....	.....	0 91	.....	11 38	.....
Bananas .....	.....	.....	.....	0 31	.....	6 45	.....
Cranberries .....	.....	.....	.....	.....	.....	9 00	.....
Lemons .....	.....	.....	.....	.....	.....	13 34	.....
Total fresh fruits .....	.....	.....	.....	1 47	.....	.....	.....
Total fresh fruits .....	.....	.....	.....	1 47	.....	.....	.....

TABLE 19—Continued

Food article	Garrison ration as per A. R. 1221		Food actually supplied in 227 messes		Proposed training ration		
	Component articles	Substitutive articles	Component articles	Substitutive articles	Component articles	Substitutive articles on basis of	
	Ounces	Ounces	Ounces	Ounces	Ounces	Energy Ounces	Protein Ounces
Coffee .....	1 12		1 03		2 0		
Tea .....						0 5	
Cocon .....						2 0	
Total coffee, etc.....	1 12		1 08		2 0		
Total coffee, etc.....	1 12		1 08		2 0		
Sugar.....	3 2		3 39		5 0		
Milk, evap .....	0 5		2 05		3 0		
Milk, fresh or reconstituted .....						5 91†	
Total milk .....	0 5		2 6		3 0		
Total milk .....	0 5		2 05		3 0		
Vinegar.....	0 64‡						
or							
Vinegar .....	0 32				0 12		
Pickles.....		0 32			0 18		
Total vinegar, etc.....	0 32	0 32			0 30		
Total vinegar, etc.....	0 64				0 30		
Pepper.....	0 04				0 02		
Salt .....	0 64				0 5		
Cinnamon.....	0 014				0 014		
Cloves.....		0 014					
Nutmeg.....		0 014				0 014	
Ginger.....		0 014				0 014	
Total spices .....	0 014		0 003		0 014		
Lard .....	0 32		0 11		0 10		
Lard substitute.....		0 32	0 88		0 60		
Total lard, etc.....	0 32	0 32	0 69		0 70		
Total lard, etc.....	0 64		0 69		0 70		
Butter.....	0 25		0 40		0 5		
Oleomargarine.....		0 25	0 11		0 5		
Total butter, etc.....	0 25	0 25	0 51		1 0		
Total butter, etc.....	0 50		0 51		1 0		
Sirup.....	1 78§		0 72		0 74		
Flavoring Extract.....	0 014				0 014		
Energy supplied .....							
Calories.....	1757		3422		4243		

†Based on 4 per cent fat.

‡Equivalent to 0.32 gill.

§Equivalent to 0.16 gill.

¶88 per cent of food supplied accounted for.

The term "training ration" was adopted in recognition of the probable eventuality that the requirements in campaigns in France would prove to be much larger. Every army of the allied nations makes such a distinction. The French have their "normal ration" for training and their "strong ration" for the field. The English have their "home ration" for training in home camps and their "field" or "field and trench" for actual military operations. The Italians have their "territorial ration" for home camps and "combative ration" for active campaigns. Aside from this, the term "garrison ration" is a misnomer for large concentration camps. It is recognized by all that a division of troops in a training camp can, under proper supervision, be subsisted on a smaller ration than can a small garrison in an isolated post.

It will be noted that the revisions proposed may be summarized as follows:

1. Reduction of meats, flour, pickles, pepper, salt and syrup.
2. Increase of beans, rice, dried or fresh fruit, jam, sugar, milk and butter.
3. Addition of oatmeal as a component.

Comparison of this summary with the one shown on page 172 indicates how nearly the observations of 1918 confirm those made by many regular army officers ten years earlier.

The total energy value of the proposed ration is 4,243 calories as compared with 4,757, calculated upon the same analyses, in the existing garrison ration. That this amount is more than enough for a training camp, even after allowing 7 per cent for waste and providing a safe margin for savings, is proved by the nutritional surveys of 427 messes summarized in Chapter XIX.

The following reasons from the nutritional point of view were urged in the letter of June 3, 1918, for the adoption of this ration:

1. It conforms to actual usage.
2. Protein provided is more than sufficient, as shown by actual consumption of meats, and is of better quality.
3. Reductions are counterbalanced in nutritive value by increases.
4. Is a better balanced ration, as regards protein, fat and carbohydrates, and mineral salts.
5. Provides more roughage.

From the standpoint of food economy or conservation, the following reasons also were urged: (1) Since meat and bread are the principal items of waste, they should be reduced; (2) the existing ration is excessive; (3) the new ration would cost 3 cents less than the garrison ration.

As a result of this communication, and of other considerations growing out of the observed enormous savings made by many organizations, the Secretary of War directed the acting Quartermaster General to

revise the system of rationing the Army in training camps (see files of Subsistence Division) and a conference was called, comprising representatives of The Adjutant General, the Inspector General, the Quartermaster General and the Surgeon General, to recommend changes. This conference met at the office of the Chief of the Subsistence Division on July 19, 1918, and the recommendations of the Surgeon General, as regards the amount of components and substitutes, were adopted.

The Subsistence Division, Quartermaster Department, prepared the recommendations for presentation to the General Staff. In conference with the Surgeon General some additions were made in the list of substitutes, the purpose being to include all the articles which might reasonably be expected to become available at different seasons of the year, so that a definite authorized list might be prepared for the use of camp quartermasters. The final system proposed contemplated the purchase of all materials through the quartermaster and the elimination of savings. In the latter recommendations the Surgeon General did not concur, holding that for hospitals especially it was essential that the mess funds be expended by the mess officer under the direction of the commanding officer; and that the savings principle at least should be retained for all messes as a stimulus to economy, even though the amount of savings should be reduced.

The final result of the recommendations made by the Surgeon General and the Quartermaster General was the authorization of changes to Army Regulations Nos. 83, 84, and 86, which became effective April 1, 1919. The ration was not changed, a sliding scale for organizations of different size was adopted, the savings principle was eliminated, and purchases were directed to be made by the camp quartermaster only. From various reports which have been received, officially and unofficially, the Surgeon General has formed the opinion that the net results have been unsatisfactory. The regulation as to purchases by the Quartermaster applied to hospitals as well as to other messes. In hospitals there has been nearly universal dissatisfaction with the new regulation.

#### FINAL CONSIDERATIONS

A restudy of all the statistical data gathered by the nutritional survey parties, including 427 messes, reinforces the arguments for a revision of the ration which were presented on June 3, 1918. In Table 20 will be found a comparison of the garrison ration, the ration actually supplied in 400 messes scattered throughout all the training camps and studied under all varieties of conditions as to climate, muscular work, period of training, etc., and the proposed training ration. The numerical results differ slightly from those presented in Table 19, but the nature of the changes is exactly the same.

TABLE 20 — *Comparison of Garrison Ration with Average Amounts Supplied in 400 Messes.*

Food article	Garrison rations per A. R. 1221		Food actually supplied in 400 messes		Proposed training ration		
	Com- ponent articles	Substi- tutive articles	Com- ponent articles	Substi- tutive articles	Com- ponent articles	Substitutive articles on basis of	
	Ounces	Ounces	Ounces	Ounces	Ounces	Energy Ounces	Protein Ounces
Beef, fresh	11 0		8 85		12 0		
Cheese						6 22	7 22
Corned beef, canned						14 7	7 2
Eggs						19 72	15 68
Fish, fresh (salmon)				0 40		18 1	10 8
Fish, fresh (cod)						53 4	22 4
Fish, preserved				0 27		23 2	8 3
Hash, corned beef				0 19		22 7	13 2
Liver				0 22		21 9	9 3
Mutton						9 07	11 5
Pork				0 75		9 8	12 9
Poultry				0 19		13 1	12 6
Veal				0 26		20 7	10 3
Total beef, etc.	11 0		8 85	2 28	12 0		
Total beef, etc.	11 0		11 13		12 0		
Bacon		3 6	0 56		2 0		
Ham				0 61		3 7	1 3
Sausage, pork				0 36		1 7	0 9
Total bacon, etc.		3 6	0 56	1 47	2 0		
Total bacon, etc.		3 6		2 3			
Flour	18 0		2 38		10 0		
Bread, soft		18 0		6 59		10 67	10 96
Bread, hard		18 0		0 08		9 22	10 00
Total flour, etc.	18 0		2 38	6 67	10 00		
Total flour, etc.	18 0			9 05	10 0		
Other cereals (oatmeal)			0 38		1 5		
Cornmeal				0 51		1 68	2 70
Farina				0 45		1 65	2 50
Total other cereals			0 38	0 96	1 5		
Total other cereals				1 34	1 5		
Baking powder	0 08				0 08		
Beans, dried	1 2		1 09		1 5		
Beans, baked, canned						1 01	4 90
Peas, canned				0 82	1 0		
Peas, dried						0 16	0 14
Corn, canned				0 80	1 0		
Total beans, etc.	1 2		1 09	1 62	3 5		
Total beans, etc.		1 2		2 71	3 5		

TABLE 20.—Comparison of Garrison Ration with Average Amounts Supplied in 300 Messes—Continued

Food article	Garrison ration as per A. B. 1221		Food actually supplied in 227 messes		Proposed training ration		
	Component articles	Substitutive articles	Component articles	Substitutive articles	Component articles	Substitutive articles on basis of	
						Energy Ounces	Protein Ounces
Rice .....		0.8	0.13		1.0		
Hominy.....				0.30		1.00	1.04
Macaroni and spaghetti.....				0.27		0.98	1.61
Corn starch .....						0.97	
Total rice, etc.....		0.8	0.13	0.57	1.0		
Total rice, etc.....		0.8		1.00		1.0	
Potatoes, white.....	14.0		12.22		14.0		
Potatoes, white, dehy.....						2.72	2.77
Potatoes, sweet.....				0.13	2.5		
Potatoes, sweet, dehy.....						0.70	0.68
Total potatoes.....	14.0		12.22	0.43	16.5		
Total potatoes.....		14.0		12.70		16.5	
Onions, fresh .....		4.0	0.74		4.0		
Onions, dehy .....						0.48	
Cabbage, fresh.....				1.11		6.44	
Cabbage, dehy.....						0.52	
Beets, fresh .....				0.09		4.63	
Beets, dehy .....						0.51	
Carrots, fresh.....				0.14		4.86	
Carrots, dehy.....						0.49	
Spinach, fresh.....				0.21		7.07	
Spinach, dehy .....						0.61	
Turnips, fresh.....				0.35		6.21	
Turnips, dehy .....						0.50	
Total onions, etc.....		4.0	0.74	1.90	4.0		
Total onions, etc.....		4.0		2.64		4.0	
Tomatoes, canned.....		2.0	1.11		2.0		
Tomatoes, dehy.....						0.13	
Total tomatoes.....		4.0	1.41		2.0		
Total tomatoes.....		2.0		1.11 <sup>2</sup>		2.0	
Prunes.....	0.38		0.46		0.5		
Apples, evap.....		0.13	0.13 <sup>2</sup>		0.25		
Peaches, evap .....		0.13	0.32		0.25		
or pears, evap.....						0.27	
or apricots.....						0.25	
or raisins and currants.....				0.13 <sup>2</sup>		0.22	
Jam or fruit batter.....		0.64	0.59		1.00		
Total prunes, etc.....	0.38	0.90	1.50	0.13	2.00		
Total prunes, etc.....		1.28		1.63		2.00	

<sup>2</sup> These figures are based on 227 messes.

TABLE 20—*Comparison of Garrison Ration with Average Amounts Supplied in 400 Messes—Continued*

Food article	Garrison ration as per A. R. 1221		Food actually supplied in 227 messes		Proposed training ration		
	Component articles	Substitutive articles	Component articles	Substitutive articles	Component articles	Substitutive articles on basis of	
	Ounces	Ounces	Ounces	Ounces	Ounces	Energy Ounces	Protein Ounces
Bananas				0 34	1 5		
Apples						2 04	
Cranberries						2 08	
Lemons						3 1	
Oranges				0 94		2 59	
Peaches						2 88	
Pears						1 72	
Pineapple				0 19		0 62	
Total fresh fruits				1 47	1 5		
Total fresh fruits				1 47 <sup>1</sup>	1 5 (as banana)		
Coffee	1 12		1 08		1 2		
Tea						0 35	
Cocoa						0 5	
Total coffee, etc.	1 12		1 08		1 2		
Total coffee, etc.	1 12		1 08 <sup>2</sup>		1 2		
Sugar	3 2		3 81		5 0		
Milk, evaporated	0 5		2 31		2 5		
Milk, fresh or reconstituted						5 30 <sup>3</sup>	
Total milk	0 5		2 31		2 5		
Total milk	0 5		2 31		2 5		
Vinegar	0 64 <sup>4</sup>						
or							
Vinegar	0 32				0 12		
Pickles		0 32			0 18		
Total vinegar, etc.	0 32	0 32			0 30		
Total vinegar, etc.	0 64				0 30		
Pepper	0 04				0 02		
Salt	0 64				0 5		
Cinnamon	0 014				0 014		
Cloves		0 014					
Nutmeg		0 011				0 014	
Ginger		0 014				0 014	
Total spices	0 014		0 003 <sup>3</sup>		0 014		

<sup>1</sup> These figures are based on 227 messes.<sup>2</sup> Based on 1 per cent fat.<sup>3</sup> Equivalent to 0 16 gill.



TABLE 20—Comparison of Garrison Ration with Average Amounts Supplied in 400 Messes—Continued

Food article	Garrison ration as per A. R. 1221		Food actually supplied in 227 messes		Proposed training ration				
	Com- ponent articles	Substi- tutive articles	Com- ponent articles	Substi- tutive articles	Com- ponent articles	Substitutive articles on basis of			
	Ounces	Ounces	Ounces	Ounces	Ounces	Energy Ounces	Protein Ounces		
Lard .....	0 32		0 11						
Lard substitutes .....		0 32	0 66						
Total lard, etc. ....	0 32	0 32	0 77						
Total lard, etc. ....	0 64		0 77						
Butter .....	0 25		0 47		0 5				
Oleomargarine .....		0 25	0 11		0 5				
Total butter, etc. ....	0 25	0 25	0 58		1 0				
Total butter, etc. ....	0 50		0 58		1 0				
Sirup .....	1 73 <sup>4</sup>		0 70		1 00				
Flavoring extract .....	0 014				0 014				
Energy supplied, calories .....	4.859		3.504 <sup>5</sup>		4.132				
Per cent distribution of calories .....	P. 12 5	F. 33.3	C. 54.2	P. 13 8	F. 31 4	C. 54 8	P. 12 6	F. 30 3	C. 57 1
<sup>1</sup> Canteen .....			13 2 31 2 55.6						
Cost based on Q. M. prices, March, 1919 .....	51.90c				48 64c				

<sup>4</sup> Equivalent to 0.32 gill.

<sup>5</sup> 3,504 calories were supplied by articles enumerated above. In addition small quantities of a large variety of other foods were also used so that the total energy supplied amounted to 3,900 calories. The percentage distribution of nutrients given is based on the food actually supplied by the messes.—(Calculations) F. H. S., 3-31-19.

<sup>7</sup> By addition of the average daily purchase from the canteen this distribution becomes 13.2 per cent P. 31.2 per cent F.; and 5.56 per cent C. H.

The arguments for a revised ration for concentration or training camps may be summed up as follows:

1. The amount of meat and flour or bread prescribed in the existing ration is an inheritance from 1794, when the other components were very limited in number. Since that time the following additions have been made: In 1818, beans, molasses for manufacture of spruce beer, replacing whiskey; in 1832, coffee and sugar, replacing all alcoholic drinks; in 1861, a pound of potatoes; in 1898, tomatoes; in 1901, prunes; in 1908, jam, syrup, evaporated milk, butter and lard. Meat and bread have not been reduced.

2. Experience in the A. E. F. has confirmed the experience in the training camps as regards: (a) The need of more vegetables, such as beans, potatoes, etc., more sugar (candy) and more milk; (b) the need of less bread and lard (see Table 16). The retention of meat in full amount, in the revised A. E. F. ration, is no justification for its retention in the home training camp; for the element of waste was not subject to control to the same degree in France. It is especially significant that the A. E. F. reduced the basal ration employed in the training areas to exactly the amount (in calories) supplied on the average to the 427 messes studied in the training camp.

3. The proposed ration supplies a sufficient amount for all seasons of the year. This is confirmed also by the experience in the A. E. F., where 400 additional calories were deemed sufficient as a winter supplement. (See Chapter XIX, (c) Influence of Season on Food Consumption.)

4. The proposed ration affords a better balance of all nutrients: proteins, fats and carbohydrates, or the organic constituents, on the one hand, and of acid and basic ash, or inorganic constituents, on the other. Too much meat is both unnecessary and wasteful; i.e., a large part of the energy of meat is not utilized, except in cold weather to keep the body warm. In other seasons, at least 40 per cent may be pure waste of metabolism. Further, the ash of meat and most cereals is acid; hence, the more meat and bread eaten the greater drain upon the system for basic elements to balance them. The ash of vegetables and fruits is alkaline; hence they should be, and, with free choice of foods, are eaten in larger quantity than prescribed in the ration. The readjustment of the ration here recommended would go far toward realizing the ideal suggested by General O'Reilly, namely, that the ration should be "sufficient in itself" and not merely a basis for the allowance in money.

5. Recent advances in the science of nutrition lay stress upon the importance of accessory substances of unknown chemical compositions and commonly termed "vitamines." These are essential constituents of the diet. The vitamins are present in largest amount in milk, fresh vegetables, and fresh fruits. The vitamine necessary to prevent beriberi is found in the embryo and pericarp of grains, in beans, and in glandular organs, such as liver. The vitamine necessary to prevent scurvy is present specially in acid-tasting fruits and vegetables. The one necessary to insure growth and prevent diseases of the eyes (xerophthalmia), and possibly "war edema," is found especially in the fat of milk (butter), being derived from grass or other green vegetable matter and in glandular organs. A dietary, therefore, should be plenti-

fully supplied with milk, or glandular organs, green vegetables and fruits. Milk is preferable to glandular organs because of the better quality of the proteins.<sup>66</sup> Any revision of the army ration should take cognizance of these important discoveries.

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<sup>66</sup> For further information see Mess Officers' Manual, and recent text-books on nutrition, especially Lusk's "The Science of Nutrition," and Sherman's "Chemistry of Food and Nutrition;" and finally the recent writings of E. V. McCollum and associates, and of Mendel and Osborn.



## MULTIPLE INTESTINAL RESECTIONS FOR GUNSHOT WOUNDS

By RALPH COLP, M. D., NEW YORK

WHILE the literature contains innumerable case reports and series of gunshot wounds of the abdomen with reference to intestinal injuries, still it may not be amiss to report a case of double intestinal resection and at the same time to review those cases of multiple resection which have been published during the past twenty years. The reparation of intestinal injuries is not new nor recent in development; as early as 1606 enterorrhaphy was urged by Fallopius. But it was not until 1882 that Kinlock reported the first case of successful intestinal suture.

For many years it has been a much mooted point, in perforating wounds of the hollow abdominal viscera, whether the expectant treatment or immediate operative interference was productive of better results. There have always been two schools—the abstentionists and the interventionists. While the majority of surgeons readily agree that exploratory coeliotomy is really the only safe and sane procedure in civilian practice, opinions differ radically concerning the injuries of war. As a matter of fact, there were many good and sound reasons why in 1914 some of the French surgeons urged and advised abstention in penetrating wounds of the abdomen. Judging from the results of operative interference in other wars, the figures were far from encouraging; for in the Crimean and American Civil Wars the mortality ranged from 87 to 92 per cent; in the recent French, 91 per cent, and in the English, 92 per cent (1). Taylor (2) states that prior to the South African War the dictum was immediate operation if the remotest chance of an intestinal injury existed. After the war, because of the impossibility of performing aseptic surgery and the poor end-results, operations were not advised and the expectant treatment was strongly recommended. During the Spanish-American War, however, the mortality dropped to about 62 per cent. Borden (3) and McAdory (1) believed that this was undoubtedly due to the small calibre of the bullets and the better operative surroundings of the patients following the injury, but not the result of the actual advances in surgery. Barney (4), Billet (4), Delorne (4), Granjux (4), Sabatier (4), and Vallois (4) advocated abstention. Billet (4) and Doche (4) claimed that even though the reduction in the mortality in the Spanish-American War seemed an important factor in urging immediate operation, even here the enthusiasts soon became conservatives; and those favoring operative intervention in the Transvaal, the Russo-Japanese, and the Chino-Japanese

wars were soon converted to the side of expectant treatment. The reasons for these apparently poor results in war surgery are evident when we consider the period of time elapsing between the reception of the injury and the time of interference, the unusual difficulties under which the operations were performed, and the inadequate and poor post-operative treatment. It is no wonder that certain surgeons were convinced that non-interference was better, claiming that if only a few intestinal perforations existed, the prolapse of mucous membrane into the openings would plug and seal the bowel, and if the peritoneum were capable at all of caring for the infection it would do so without operative interference.

W. L. Rodman (5) states that in a series of the unoperated the mortality was 55 per cent, and his figures correspond identically with those of Von Oeltingen (5) of Berlin. Senn (5) in the First and Third Division hospitals during the Cuban War saw many cases of undoubted penetrating wounds of the abdomen that were on a fair way to recovery without operation. Without doubt, there were cases with perforations which recovered without surgical interference. It is true that bullets may pass through an abdomen without injuring any of the contents, for cases of this nature have been reported by McGuire (5), Oliver (5), Senn (5), Stimpson (5), and Rodman (5). The author experienced this in the case of L. E., No. 10341, January 1, 1920, Volunteer Hospital, New York, in which there were two through-and-through perforations of the abdominal wall without any damage to the viscerai contents. On the other hand, it is amazing what injuries one single bullet may cause. All that is necessary is a glance at the innumerable single case reports which fill the literature. The surprising feature of these is what visceral injuries may exist and the patient still recover, lesions which, had they been treated expectantly and not surgically, would have been hopeless.

Sejournet (6) claims that the latter laparotomies did not result in death, but that a study of the causes of mortality in these cases shows that none could have been saved naturally by abstention. Malcolm (7), writing in 1918, states that while prior to 1914 the treatment was conservative, at present immediate and early operation is advised; and although the death rate is still heavy, the patients who died of wounds would not have lived without an operation, and many who recovered would most certainly have died without interference. Toward the close of the Great War, the consensus of opinion appears to be epitomized in the saying of Terrier: "It is more worthwhile to make a useless intervention rather than to miss a necessary intervention."

The question as to operative procedure in gunshot injuries of the intestines is an open one. There are several alternatives: suture of the

various perforations, resection of a portion of the intestine containing the perforations, the combination of both of these or possibly multiple resections. The choice between suture and resections is comparatively simple. Suture of intestinal wounds is to be done whenever possible; as a rule it is performed more quickly, is less productive of shock and, if the perforations are few, does not sacrifice any intestine.

There are certain indications, however, which demand more radical measures. Resection must be performed if there are many perforations grouped together and suture would narrow the lumen to such an extent that stricture might result; or, if the tissues about the perforations are so devitalized from the trauma that secondary perforations might ensue; or, if the mesentery is so badly damaged that the blood supply to the intestinal segment is compromised.

As is already known, it is possible to resect almost half the total length of the small intestine and hope for recovery. Whitehall (8), reporting his own successful case of a 10-foot resection, mentions one by Ruggis of 11 feet. These were performed for causes other than those of acute perforations, and the patient did not have to combat in addition the possibilities of peritonitis. But Wallace (9) reports a resection of 9 feet of perforated intestine, and Toombs (10) one of 10 feet for twenty-four perforations. Both these cases recovered.

Flint (11), in his researches on the effect of extensive resections on the small intestines of dogs, has concluded that at least 50 per cent may be removed; and although there is suffering with severe diarrhea within a short period of time, compensatory hypertrophy and hyperplasia of the remaining intestine results. He believes that humans behave largely as do animals, and that the metabolic disturbances bear no relationship to the length of small intestine resected; for five cases with over 400 cm. recovered, while death from inanition resulted in resections of 284 to 300 cm. However, resection of human intestines should never be an operation of choice, and the general surgical rule of resecting the smallest length of intestine which is consistent with safety should always be rigidly followed.

If the perforations are many and scattered over widely separated segments of intestine, and the shock of performing an extensive resection might be too severe or surgically impossible, it is perfectly possible to perform multiple intestinal resections. Multiple intestinal resections have been done, and done successfully. A review of the literature from 1900 to 1920 shows that many cases have been reported containing very interesting and valuable information. Of course, the records are often incomplete, wanting in detail, consisting practically of an outline, for the majority were performed during the stress and strain of war. In

all, fifty-four cases have been reported, of which twenty-one were successful. These statistics cannot be interpreted on their face value; they are probably not representative of the sum-total of multiple resections performed, because, doubtlessly, many more have been attempted, but were not reported because of an unfavorable outcome. Taylor (12) believes that the high mortality of double intestinal resections in the war was due to the severe injuries which necessitated such an operation, and not to the operation itself.

Auvray (13) reports a successful case in which five separate segments of small intestine were resected. As far as is known, this is the only quintuple resection to be found. The quadruple resections of Vertraeghe (14) and Okinezye (15) were both fatal. Kohlmann (16) and Hunt (17) each report a triple resection with recovery. Double resections are not uncommon, forty-four having been reported.

From a study of Wallace's (18) report of 1,200 cases of abdominal gunshot wounds, it appears that the mortality of those cases in which the perforations were sutured was about 54 per cent, and the mortality of single resections was about 60 per cent. In another series of 511 cases (19) the mortality of single resections was 74 per cent. He also states that all double resections which he knows of had been fatal excepting one case.

The mortality of double resections in this collected series is 59 per cent. Agreeing that this percentage is too low, still it unquestionably proves that double resections are not impossible, are practical, and are far better than extensive single resections which sacrifice enormous length of bowel and yield dire after-results. Certainly in civilian practice, where operative conditions are usually more perfect, the mortality of short multiple resections should probably be no higher than that of single resections of many feet.

Probably one of the most important factors in lowering the mortality of intestinal injuries of the perforated type is the time elapsing between the inception of the injuries and the operation. The intensity of the peritoneal inflammation seems to vary directly with the time elapsed. And if cases are operated upon early, their prognosis is relatively good. The reports of Rodman (20) and Lothrop (21) seem to adequately prove this.

Rodman's report:

<i>Time after injury</i>	<i>Mortality per cent</i>
1 to 4 hours.....	15
4 to 8 hours.....	44
9 to 12 hours.....	63
12 hours and over.....	70

Lothrop in a series of 154 cases gives the following:

<i>Time after injury</i>	<i>Mortality per cent</i>
5 hours . . . . .	52
10 hours . . . . .	74
20 hours . . . . .	74
25 hours . . . . .	78

Rouvilleis (22) states that, although the number of lesions in the same organ is necessarily a grave factor, still it is not as important as the oldness of the wounds. He cites cases of six, seven, and ten perforations respectively, all successfully operated upon within six hours after injury. These facts argue vehemently against keeping patients in civilian practice under observation, watching for rigidity and the other classical signs of peritoneal irritation to develop. Time lost in watchful waiting counts definitely in the ultimate outcome. An exploratory laparotomy, even if nothing pathological is discovered, is not a serious error in surgical judgment nor a dangerous operative procedure. However, in a small group of cases which are in deep shock, it is often better to wait until they have reacted or their general condition has been improved by appropriate stimulation before operation is undertaken.

As far as the incision is concerned, it is mainly made to either side of the mid-line; it should be long enough and sufficiently large to permit of a thorough exploration, for in gunshot wounds each and every organ must be carefully, thoroughly and systematically examined. Hemorrhage is always to be controlled first. When perforations are found they should be covered with gauze and the remainder of the gut examined before any procedure is instituted, as the number, location and grouping of the lesions will determine the type of operation. If a resection is to be performed, the majority of surgeons employ end to end anastomosis by suture; Lockwood (23) and others prefer the side to side, and some have employed the Murphy button, Hunt (17) having used it three times for his triple resection.

The question of irrigation of the peritoneal cavity in these cases is still an open one. Guerry (24), in a series of twenty-three cases of gunshot wounds of the abdomen with two deaths, advises thorough irrigation of the abdominal cavity with a salt solution with a two-way irrigator. Some of the French surgeons employ lavage of the peritoneal cavity with ether, and Hughes (25) is of the opinion that about three ounces of ether left in the peritoneal cavity after operation has a good effect in preventing post-operative intestinal inertia. Those who oppose peritoneal lavage claim that just as the irrigating fluid may cleanse the peritoneum so it may also spread the infection. However, this



does not seem to be quite reasonable; if there is infection present, the exploration in itself, which in gunshot cases must be very thorough, will have already spread the infection. By a thorough lavage with warm sterile saline everything is to be gained and really nothing lost. Besides, the saline is an added stimulant and helps materially to diminish shock.

Drainage, of course, is a matter of experience, depending upon the time after injury, the location of the lesions, the amount and character of the peritoneal fluid and the degree of reaction of the peritoneum to it. In this series it was definitely stated that twelve cases were drained and of these seven recovered; and of the four cases not drained three recovered. This number is far too small to yield any conclusions.

To summarize, then, immediate operation rather than conservative treatment is indicated in all perforating gunshot wounds of the abdomen, especially in civilian practice. That while suture is the operation of choice, if the perforations are many, resection is preferred. And if these perforations are grouped but widely scattered, not only are multiple resections practical but they are definitely indicated. Finally, the mortality of multiple intestinal resections is probably not greater than those of single resections.

*Résumé of Case of Double Intestinal Resection for Multiple Perforations of the Intestine*

J. B., age 26; married; occupation, laborer; Italian.

Admitted, Volunteer Hospital, New York, 9-28-19.

Discharged to prison ward, 10-14-19.

Diagnosis: Perforating bullet wound of abdomen with multiple perforations of the small intestine.

Result: Cured.

Present history: The patient was in a gambling fight which resulted in a shooting fray. He was struck with a bullet of a 45-caliber revolver.

He was brought to the hospital by an ambulance about forty-five minutes after the accident.

Past history: Irrelevant.

Family history: Irrelevant.

Physical examination: A young man well nourished, extremely well developed, pale, breathing shallow. General condition, fair. Pulse, 124. Respirations, 20. Temperature, 99.

The general physical examination was negative with the exception of the abdomen, and a through-and-through bullet wound of the right forearm and the left thigh.

*Abdominal Examination.*—The abdomen, especially in its upper half, moved but little with respiration. It appeared slightly distended. About  $3\frac{1}{2}$  inches below the costal margin in about the center of the right rectus muscle was an irregular, punctured wound about  $\frac{1}{2}$  inch

in diameter, which exuded a greenish, frothy liquid with a fecal odor. There was but slight rigidity over the upper half of the abdomen, and marked tenderness in this region. There was no evidence of either free fluid in the flank nor was there any obliteration of the liver dullness. There was no evident wound of exit.

*Operation.*—Anesthesia, open ether. Time of operation, two hours and twenty minutes. Prior to operation, an injection of 5,000 units of tetanus antitoxin was administered.

*Pathology.*—Upon incision of the peritoneum some blood-tinged greenish fluid with a fecal odor escaped. The omentum was torn through its central portion, and slight capillary oozing was apparent from its inner free edge. The contents of the upper abdomen, liver, gall bladder, stomach, duodenum and spleen were without injury. But the jejunum and ileum were the seat of several perforations. One part of the upper ileum was the seat of four perforations involving about 5 inches of the jejunum; about 3 to 4 feet farther was a single, large, through-and-through perforation; and about one foot from the caecum were two smaller perforations. The colon was normal, and there was no injury to the pelvic organs. There was a through-and-through bullet wound of the left thigh just below Scarpa's triangle and a through-and-through bullet of the right forearm.

*Procedure.*—A 7-inch upper right rectus incision was made, fascia incised and cut, rectus muscle bluntly separated, and posterior sheath together with peritoneum incised. Exploration. Segment of jejunum with four perforations isolated and padded off. Gut doubly clamped on each side beyond injured area. Mesentery ligated and intestine excised. End to end anastomosis: locked chromic through-and-through suture approximating adjacent mucous membrane, and a Cushing suture of chromic catgut approximating the distal mucous membrane; serosa to serosa with Lembert of silk. This procedure was repeated in the case of a through-and-through perforation resecting about 2 inches in ileum. The two smaller perforations were closed with a chromic purse-string suture reinforced with plain gut. The peritoneal cavity was thoroughly lavaged with hot saline, and about a liter left in the abdominal cavity. Two rubber drainage tubes placed toward the pelvis and one cigarette drain to the right lower quadrant. Peritoneum and fascia closed with continuous plain gut, anterior sheath with chromic, skin with silk. Bullet wounds of arm and thigh iodinated and dressed dry.

Condition: good. Medication on table, saline infusion, 800 c.c. Drains: two tubes, one cigarette. Specimens: two pieces of resected intestines.

*Post-operative Course.*—As soon as the patient was conscious he was placed in Fowler's position, given tap water by rectum by Murphy drip, four hours on, one hour off, for four days. Twenty-four hours after operation he became slightly distended and began to vomit dark brown fluid. Colon irrigation with pituitrin 1 c.c. was ordered twice a day. Inasmuch as he vomited on and off the third day post-operative he was given a gastric lavage and an irritative enema followed by a soap-suds enema. After this he became very much more comfortable and his general condition improved. During this period his temperature ranged

from 102 to 100.8, his pulse from 140 to 96, and his respirations 32 to 20. His diet eight hours after operation consisted of water in teaspoonful doses. This was increased, and on the third day he was given peptonized milk which was gradually increased.

*Dressings.*—On the fourth day after operation cigarette drain removed and replaced with catheter. The fifth day two pelvic tubes removed and replaced with single catheter. The tenth day, patient complains of pain in the region of the rectum to the left side. On examination this was found to be a small localized abscess which on incision yielded a little pus and the bullet. The twelfth day post operative, inasmuch as the discharge from the wound was getting less and less; the catheters, which were gradually shortened, were finally removed. On the sixteenth day, post-operative, the patient was in a good condition to be transferred to the prison ward.

*Follow-up Note.*—The patient was last heard of in February, 1921. He was well and enjoying perfect health and working as a day laborer.

QUINTUPLE RESECTIONS

Author	Journal	Résumé of Resections	Result
Auvray	La Presse Medicale, 1915, p. 376.	Four segments of 2 perforations each and one segment of 5 perforations resected. End to end anastomosis for 5 resections. Lavage of the peritoneum with ether. Drainage, 3 tubes, one to pouch of Douglas.	Cured

QUADRUPLE RESECTIONS

Vertraeghe	Bull. et Mem. Soc. de Chir. de Paris, 1915, vol. xli, p. 977.	Four segments resected.	Died
Okinczye	Bull. et Mem. Soc. de Chir. de Paris, 1918, vol. xliv, p. 307.	Four segments resected for 12 perforations. End to end anastomosis for 4 resections. Lavage of the peritoneum with ether. Drainage. Eleven hours after injury.	Died

TRIPLE RESECTIONS

Ross	American Jour. of Obst. & Gyn., 1904, vol. i, p. 644.	Triple resection with anastomosis of 3 segments by Murphy buttons.	Died
Kohlmann	New Orleans Med. and Surg. Jour., 1914, vol. lxvii, p. 711.	Three segments of ileum containing 9 perforations, 2.5, 5, 7.5 cm. respectively resected. End to end anastomosis for 3 segments. Two hours after injury.	Cured
Hughes and Hea	Lancet, London, 1917, vol. i, p. 642.	Triple resection. Three hours after injury.	Died
Hallopeau	Bull. et Mem. Soc. de Chir. de Paris, 191, vol. xiii, p. 891.	Three segments resected for 10 perforations, 10, 20, and 30 cm. respectively, and suture of 2 isolated perforations. End to end anastomosis for 2 segments.	Died.
Campbell	Lancet, London, 1919, vol. i, p. 461.	Three segments resected, each 12.5 cm. respectively. Death from pneumonia, 10 days later.	Died.
Taylor	Lancet, London, 1919, vol. i, p. 461.	Resection of 60 cm. upper jejunum, 110 cm. transverse colon, and part of sigmoid. Given blood transfusions.	Died.
Hunt	Boston Med. and Surg. Jour., 1920, vol. clxxxiii, p. 275.	Three segments resected for eighteen perforations, measuring 52.5, 31.5 and 00 respectively. Three anastomoses performed by Murphy buttons. Drainage. Operation 2 hours after injury. Sixty-six hours p. o. enterostomy for paralytic ileus; suture of fistula 5 weeks later.	Cured.

## DOUBLE RESECTIONS

<i>Author</i>	<i>Journal</i>	<i>Résumé of Resections</i>	<i>Result</i>
Winslow	A. M. A., 1905, vol. xlv, p. 1018.	Double resection, each segment of small intestine measuring 5 cm. One anastomosis by Murphy button, other by end to end. No drainage.	Cured.
Spencer	Medical Progress, Louisville, Ky., 1907, vol. xliii, p. 8.	Double resection, 4 and 5 cm. No drainage.	Cured.
Nitch	Medical Press and Circular, London, vol. xc, p. 438, 1910.	Double resection for 18 perforations each 45 cm. in length. Suture of isolated perforations. End to end anastomosis. Drainage. Operation 3½ hours after injury. Four days p. o. following cough, wound opened with escape of omentum. Omentum removed, wound closed.	Cured.
Houghton	Brit. Med. Journal, 1911, vol. ii, p. 1594.	Double resection of small intestine, each 30 cm. End to end anastomosis. No drainage. Operation 1 hour after injury.	Cured.
Spalding	Kentucky Med. Jour., 1911, vol. ix, p. 353.	Double resection for 9 perforations, 15 and 30 cm. respectively. Suture of isolated perforations. Drainage. Operation 3 hours after injury. Died of tetanus 16 days after operation.	Died.
Fort	Kentucky Med. Jour., 1911, vol. x, p. 78.	Double resection of 12 and 17 cm. Suture of 2 isolated perforations. End to end anastomosis. Patient 6 years old.	Cured.
Crawford	New Orleans Med. and Surg. Journal, 1914, vol. lxvii, p. 1-8.	Double resection for 7 perforations, 17.5 and 5 cm. Suture of 8 isolated perforations. End to end anastomosis. Drainage.	Cured.
Houvier, Caudrelier and Schwartz.	Bull. et Mem. Soc. de Chir. de Paris, 1915, vol. xli, p. 1262.	Double resection of 20 and 25 cm. Lavage of the peritoneum with ether. Drainage.	Died.
Abadie	Bull. et Mem. Soc. de Chir. de Paris, 1916, vol. xlii, p. 489.	Double resection, one with Murphy button, the other with end to end anastomosis. Suture of the bladder. Lavage of the peritoneum with ether. Operation 6 hours after injury.	Died.
Webb and Milligan.	Brit. Jour. of Surgery, 1916, vol. 4, p. 338.	Double resection of 22 and 75 cm. for 6 perforations. Lateral anastomosis for both. Pelvic drain. Operation 29 hours after injury.	Cured.
Wallace	Jour. Royal Army Med. Corps, 1916, vol. xxvi, p. 802.	Double resection.	Cured.
Meyers, Taylor and Bowlby.	Lancet, London, 1916, vol. i, pp. 8-15.	Double resection of 22.5 and 10 cm. jejunum. Lateral anastomosis and end to end anastomosis. Suture of one isolated perforation. Drainage.	Cured.
Shaw, Stevenson and Mackenzie.	Lancet, London, 1916, vol. ii, p. 173.	Double resection for 19 perforations. End to end anastomosis.	Cured.
Lucas-Champagnonniere et Delay.	Bull. et Mem. Soc. de Chir. de Paris, 1916, vol. xlii, p. 2077.	Double resection of 9 and 5 cm. for 7 perforations. Suture of 7 isolated perforations. End to end anastomosis. Drainage. Operation 2 hours after injury.	Cured.
Mathieu	Ibid., p. 2047.	Double resection of 8 and 10 cm. Drainage.	Died.
Houthier	Ibid., p. 708.	Double resection of 50 cm. End to end anastomosis. Lavage of the peritoneum with ether. Drainage.	Died.
		Double resection, each segment 15 cm. End to end anastomosis. Lavage of the peritoneum with ether. Drainage. Operation 3½ hours after injury.	Died.

<i>Author</i>	<i>Journal</i>	<i>Résumé of Resections</i>	<i>Result</i>
Routhier	Ibid., p. 708	Double resection involving 20 cm. for 10 perforations. End to end anastomosis. Lavage of the peritoneum with ether. Drainage. Operation 8 hours after injury.	Died
Chevassu	Ibid., p. 616.	Double resection for 4 perforations. Operation 2 hours after injury.	Cured.
English	Lancet, London, vol. ii, p. 746, 1916.	Double resection.	Died
Barliag	Brit. Med. Jour., 1916, vol. iv, p. 772.	Double resection.	Died
Simonin	Bull. et Mem. Soc. de Chir. de Paris, 1917, vol. xliii, p. 891.	Double resection of 25 and 10 cm. anastomosis.	Died.
Migniac	Ibid., p. 1832.	Double resection involving 70 cm. Anastomosis by Murphy button. Operation 3 hours after injury.	Died.
Blair	Jour. Roy. Army Med. Corps, 1917, vol. xxviii, p. 379.	Double resection of 45 and 10 cm. 3 isolated perforations and of bladder injury. Drainage.	Died.
Barber	Lancet, London, 1917, vol. i, p. 93.	Double resection of 15 and 20 cm. Anastomosis by end to end. Suture of isolated perforations. Operation 12 hours after injury.	Died.
Hughes and Rees.	Ibid., p. 1832.	Double resection. Operation 12 hours after injury.	Died.
Goltman	Surg., Gyn. and Obst., vol. xxvi, p. 2, 1918.	Resection of 5 cm. of ileum and 10 cm. of colon. Anastomosis of intestine with end to end, colon by Murphy button.	Died
		Resection of 15 cm. of small intestine and 10 cm. large intestine. Operation 24 hours after injury.	Died.
Barrow	Kentucky Med. Jour., 1918, vol. xvii, p. 243.	Resection of 12 cm. of small intestine and part of sigmoid for 5 perforations. Lateral anastomosis for small intestine and Murphy button for large. No drainage. Operation 2 hours after injury.	Cured.
Okinczye	Bull. et Mem. Soc. de Chir. de Paris, 1918, p. 307.	Double resection for 4 perforations, and 2 mesenteric tears. End to end anastomosis. Lavage of the peritoneum with ether. No drainage. Operation 7 hours after injury.	Died
Paschini	Policlinico, Roma. Abs. A. M.A., Feb. 2, 1919.	Double resection involving 1.5 meters. Operation 2 hours after injury.	Cured.
Taylor	Lancet, London, 1919, vol. i, p. 461.	Resection of 90 cm. for 12, and 30 cm. for 4 perforations of the jejunum. End to end anastomosis. Operation 5 hours after injury.	Cured.
		Resection of 90 cm. of jejunum and part of transverse colon. End to end anastomosis, temporary colostomy. Operation 6 hours after injury.	Cured.
		Resection of jejunum and 17 cm. of ileum and part of sigmoid for 10 perforations. End to end anastomosis. Suture of isolated perforations. Temporary caecostomy. Operation 6 hours after injury.	Cured.
		Hernia of 1.8 meters of shattered intestine in the wound. Resection of 1.2 meters jejunum and 70 cm. ileum. End to end anastomosis. Anterior crest of ilium excised and wound packed. Operation 8 hours after injury. Blood transfusion.	Cured.

*Note:* The author performed 11 operations of this nature, but only these 4 reported cases lived.

## BIBLIOGRAPHY

- (1) McAdory, Post Graduate, New York, 1908, vol. 23, p. 614.
- (2) Taylor, British Medical Journal, i, 1900, p. 1424.
- (3) Borden, Article by Holladay, New York Medical Journal, 1908, vol. 88, p. 595.
- (4) Barney, MILITARY SURGEON, Carlyle, Pa., 1909, vol. 24, p. 430.
- (5) Rodman, American Pract. and News, Louisville, 1903, vol. 35, p. 261.
- (6) Sejournet, Progres Medical, Paris, 1916, 3s., vol. 31, p. 23.
- (7) Malcolm, Proc. Royal Soc. Med., London, 1918-1919, vol. 12. Section, Obstetrics and Gynecology, p. 1.
- (8) Whitehall, Annals Surgery, Phila., 1911, vol. 54, p. 669.
- (9) Wallace, Journal Royal Army Medical Corps, 1915, vol. 25, p. 591.
- (10) Toombs, Railway Surg. Journal, 1914, p. 98.
- (11) Flint, Johns Hopkins Hospital Bulletin, 1912, vol. 23, p. 127.
- (12) Taylor, Lancet, London, 1919, i, p. 461.
- (13) Auvray, La Presse Medicale, 1915, p. 376.
- (14) Vertraeghe, Bull. et Mem. Soc. de Chir. de Paris, 1915, vol. 41, p. 977.
- (15) Okinezye, Bull. et Mem. Soc. de Chir. de Paris, 1918, p. 300.
- (16) Kohlmann, New Orleans Medical and Surgical Journal, vol. 67, p. 711, 1914.
- (17) Hunt, Boston Medical and Surgical Journal, 1920, vol. 183, p. 275.
- (18) Wallace, British Journal Surgery, 1916-1917, vol. 4, p. 279.
- (19) Wallace, Journal Royal Army Medical Corps, 1916, vol. 26, p. 802.
- (20) Rodman, Article by Graham, Surgery, Gynecology and Obstetrics, 1909, vol. 8, p. 351.
- (21) Lothrop, Boston Medical and Surgical Journal, 1900, p. 465.
- (22) Rouvillois, Bull. et Mem. de Chir. de Paris, 1917, n.s., vol. 43, p. 705.
- (23) Lockwood, British Medical Journal, 1917, vol. i, p. 317.
- (24) Guerry. A. M. A., June 5, 1912.
- (25) Hughes, British Journal Surgery, 1916-1917, vol. 4, p. 744.



## COMMENT AND CRITICISM

### GENERAL REGULATIONS FOR THE OFFICERS' RESERVE CORPS AND THOSE PERTAINING TO THE MEDICAL DEPARTMENT RESERVE CORPS AS EXTRACTED FROM S. R. NO. 43, W. D., 4 AUGUST, 1921.

*(Concluded from January, 1922)*

#### SECTION XV

#### ASSIGNMENT AND TRANSFER

120. **ASSIGNMENT JURISDICTION.**—For administrative control each reserve officer is under the jurisdiction of the commander of the department or corps area in which his permanent residence or military station, if in the Regular Army, is located. For training or assignment, or both, most, though not all, reserve officers are placed under the jurisdiction of department or corps area commanders. The term assignment, as used in reference to reserve officers, refers to an assignment or designation for a class of duty, or a specific duty for which it is contemplated to use the officer in time of emergency and for which it is contemplated he be trained in time of peace.

121. **DISTRIBUTION FOR ASSIGNMENT.**—For purposes of assignment, reserve officers are divided into three groups:

(a) *General Assignment Group.*—The officers in this group are selected by the War Department and are for assignment to special duties and activities which, in time of peace or war, are not included in the jurisdiction of chiefs of branches or of territorial commanders who function in time of peace. The selection and assignment of such officers and the scope of duties they are to perform will be covered by instructions of the Secretary of War issued from time to time. For convenience of reference, this group will be referred to by the abbreviation G. A. Group.

Officers will be placed in and removed from the G. A. Group by The Adjutant General of the Army, upon the request of the chief of the activity for which their services are desired to be reserved, in accordance with approved policies.

The names of officers in the G. A. Group and their assignments will be recorded in the personnel bureau, Adjutant General's Office. The chief of this bureau will cause the records to be kept in such form as will facilitate the prompt issuance of orders regarding these officers in case of emergency, and will cause the chief of the branch in which the officer is commissioned, the commander of the department or corps area in which he resides or is stationed, and the chief of the activity for which

he is reserved to be notified of the placing in or the removal of any officer from the G. A. Group.

The chief of the personnel bureau, Adjutant General's Office, will cause each officer of the G. A. Group to be notified of his assignment.

(b) *Branch Assignment Group*.—The officers of this group are selected by the chiefs of branches and are for assignment by those chiefs to special duties and activities pertaining to the various branches. For convenience of reference, this group will be referred to by the abbreviation B. A. Group.

Officers will be placed in and removed from the B. A. Group by The Adjutant General of the Army upon the request of the chief of the branch concerned, in accordance with approved policies.

The names of officers in the B. A. Group and their assignments will be recorded in the appropriate offices of the several chiefs of branches, who will cause the records to be kept in such form as will facilitate the prompt issuance of orders regarding these officers in case of emergency.

The chief of the branch will cause each officer of the B. A. Group pertaining to his branch to be notified through the department or corps area commander of his assignment.

(c) *Territorial Assignment Group*.—This group includes all reserve officers not included in the G. A. Group or B. A. Group. Such officers are available for assignment by department or corps area commanders to any organizations or activities within their territory, not exempted from their control by specific orders of the War Department. Assignment may be made to any of the components of the Army, except that assignments to the Regular Army and National Guard will be made only as specifically authorized by the War Department. In order to adhere as closely as possible to the principle of the localization of units of the Organized Reserves, department and corps area commanders are authorized to attach officers to appropriate units in excess of the strength prescribed by Tables of Organization. For convenience of reference this group will be referred to by the abbreviation T. A. Group.

Officers will be placed in and removed from the T. A. Group by The Adjutant General of the Army in accordance with approved policies.

The department or corps area commander is responsible for the assignment of officers in the T. A. Group pertaining to his department or corps area.

The department or corps area commander will notify each officer of the T. A. Group, pertaining to his department or corps area, of his assignment.

122. MEMBERS OF THE REGULAR ARMY AND NATIONAL GUARD.—In view of their dual status, reserve officers who are also members of the Regular Army or National Guard will be disposed of as follows:



(a) *Officers, warrant officers, and enlisted men of the National Guard.*—These will be included in the T. A. Group. They will be carried as on duty with the National Guard of the proper state, the specific assignment therein being a function of the state.

(b) *Warrant officers and enlisted men of the Regular Army stationed in the continental limits of the United States (and those serving with an expeditionary force outside the continental limits of the United States).*—These will be included in the G. A. Group or B. A. Group. In general, those of the B. A. Group will not be given specific assignments in time of peace. When an emergency arises, chiefs of branches, from a consideration of the immediate availability of these officers and the needs of the Army, will determine and recommend the use which, in their opinion, should be made of this class of reserve officers.

(c) *Warrant officers and enlisted men of the Regular Army stationed outside the continental limits of the United States (except those serving with an expeditionary force).*—These will be included in the T. A. Group and will be assigned by department or corps area commanders in whose territorial jurisdiction they are serving in accordance with their special needs or projects.

123. CLASSIFICATION.—As a basis for suitable assignment, all reserve officers will, upon appointment, be initially classified by the chiefs of branches. All available records will be used in this classification, and all data having a bearing upon the officer's availability and suitability for assignment will be recorded on an abstract of record card (Form 761, A. G. O.). Upon completion of the initial classification, the abstract of record cards will be filed and kept up to date as follows: G. A. Group—in the personnel bureau, A. G. O.; B. A. Group—in the offices of chiefs of branches; T. A. Group—at the headquarters of departments and corps areas.

124. CONTINUANCE OF CLASSIFICATION.—After initial classification the office charged with the assignment of reserve officers will take steps to improve the data on the abstract of record form by securing additional information and by affording reserve officers full opportunity for making such statements as they desire relative to their qualifications or preferences.

125. REASSIGNMENT.—Reassignment will be made as follows:

(a) Any reserve officer who accepts a commission in or enlists in the National Guard shall be relieved from any assignment he may have as a reserve officer and be reassigned in accordance with the preceding instructions.

(b) The assignment of any reserve officer who makes a permanent change of residence will be reconsidered, with a view to making the assignment correspond geographically with the new permanent resi-

dence. All records at department or corps area headquarters pertaining to an officer who has changed his permanent residence from one department or corps area to another will be forwarded direct to the new corps area or department commander.

(c) Reassignments will be made when additional data bearing upon qualifications, changes of preference, or other factors indicate the desirability of reassignment in accordance with the general plan of having each officer assigned to a duty for which qualified.

126. **TRANSFER BETWEEN SECTIONS.**—Transfers from section to section of the Officers' Reserve Corps will be made only for cogent reasons and when in the best interests of the service. No officer will be transferred without his consent. Recommendations or applications for transfer will be submitted to The Adjutant General of the Army through military channels, including in each case the office having assignment jurisdiction. The latter office will make a definite recommendation in each case. In each case The Adjutant General of the Army will obtain the recommendations of the chiefs of the branches concerned and will take final action based upon a consideration of all recommendations. A transfer, when made, will be without change of grade or date of appointment, the officer thus continuing to serve in the new section the unexpired portion of the five-year period for which appointed. Recommendations or applications for transfer must be limited to those involving no change of grade. If a change of section and an increase of grade are involved, the procedure must be in accordance with the section of the regulations governing promotion.

#### SECTION XVI

#### ACTIVE DUTY

127. **GENERAL CLASSES OF ACTIVE DUTY.**—Active duty for reserve officers is of two general classes—active duty in a national emergency declared by Congress, and active duty in time of peace.

128. **ACTIVE DUTY IN A NATIONAL EMERGENCY.**—In time of a national emergency expressly declared by Congress, the President may order reserve officers to active duty for indefinite periods without their consent. For this duty some reserve officers will be needed before others. The preferences of an officer for immediate or deferred call to active duty are taken into consideration in determining, in time of peace, his assignment for duty in an emergency.

129. **ACTIVE DUTY IN TIME OF PEACE.**—Reserve officers may be ordered to active duty in time of peace for training, instruction, or temporary duty, provided there are funds available for their payment

specifically appropriated for this purpose by Congress. No reserve officer shall be employed on active duty in time of peace without his own consent, except that, if funds for their payment have been appropriated, they may, without their consent, be placed on active duty for training and instruction not to exceed 15 days in any calendar year. So far as practicable, the personal desires of officers to be called to active duty will be considered when funds for training only a portion of the reserve forces in any year are available. Both in an emergency and at other times, as much notice as circumstances permit will be given officers prior to their call to active duty.

130. **EXEMPTION FROM ACTIVE DUTY.**—A reserve officer called to active duty for training purposes during any calendar year and upon whom such duty, for business or other good reasons, would work a hardship, will, upon request, be exempted from such tour of duty.

131. **ACTIVE DUTY OTHER THAN A 15-DAY PERIOD.**—Active duty other than for a 15-day training period may be for a course of instruction at a service school, for instruction while attached to the Regular Army, or for any duty of a temporary nature. No officer will be called for such duty without his consent. Applications or recommendations for such duty should be made to department and corps area commanders, who, under policies determined and announced by the War Department in accordance with annual appropriations, will be charged, in general, with the selection of the limited number of reserve officers, if any, to be placed on active duty. Requests not covered by announced policies will be forwarded by department and corps area commanders to the War Department.

132. **PAY AND ALLOWANCES.**—A reserve officer when on active duty shall receive the same pay and allowances as an officer of the Regular Army of the same grade and length of active service and mileage from his home to his first station and from his last station to his home, but shall not be entitled to retirement or retired pay. Pay status begins on the date that the officer officially complies with the order calling him to active duty and ends when he is relieved from active duty. In time of peace an officer relieved from active duty is entitled to pay during the actual time required to travel from his last station to his home, to be computed over the shortest usually traveled route.

133. **RESERVE OFFICERS HOLDING NATIONAL GUARD COMMISSIONS.**—Reserve officers holding commissions in the National Guard and ordered to active duty in accordance with the provisions of sections 81 or 99, National Defense Act, will be paid, as provided for in those sections, out of the whole fund appropriated for the support of the Militia. They may, therefore, be ordered to active duty under sections 81 and

99 only within the limits of National Guard funds available for their payment.

134. **ACTIVE DUTY WITH THE WAR DEPARTMENT GENERAL STAFF.**—In time of peace reserve officers may be ordered to active duty and placed on duty with the War Department General Staff, in accordance with the provisions of sections 3a and 5 of the National Defense Act as amended June 4, 1920. Only those officers may be detailed who are recommended for such duty by the governors of the several states.

135. **WARRANT OFFICERS AND ENLISTED MEN OF THE REGULAR ARMY AND THE NATIONAL GUARD.**—Warrant officers and enlisted men of the Regular Army or National Guard or retired warrant officers and enlisted men of the Regular Army who are appointed reserve officers will continue to serve as warrant officers or enlisted men, active or retired, in the arm, staff corps, or department to which they pertain. If they are ordered to *active* duty as reserve officers they will become *inactive* as warrant officers or enlisted men, and *active* as officers. Upon being relieved from duty or discharged as reserve officers, they will revert back to their warrant or enlisted status without loss of rank. Such warrant officers and enlisted men while serving as reserve officers on active duty will receive the pay and allowances of officers, and during such time are entitled to no pay or allowances as warrant officers or enlisted men. All service rendered as an officer will be credited to the time of such warrant officer or enlisted man under his warrant on enlistment contract. If enlistment expires while serving as an officer, immediate reenlistment is authorized.

136. **PHYSICAL EXAMINATION WHEN ORDERED TO ACTIVE DUTY.**—All reserve officers when ordered to active duty will be given a thorough physical examination immediately upon reporting for duty. The examination will be made complete in order that all physical disqualifications or defects be discovered and recorded. If the call be for active duty in time of peace, report of physical examination will be made as follows:

(a) If there are no disqualifying defects, a certificate to that effect will be made by the examining officer and forwarded to the department or corps area commander, who will cause it to be noted and filed.

(b) If there are disqualifying defects, a full report on Form 395, A. G. O., will be made and forwarded, through channels, to the department or corps area commander, by whom it will be noted on the officer's record and forwarded to The Adjutant General of the Army with suitable recommendation. When he deems such action desirable, the department or corps area commander will, before forwarding reports, relieve the officer from active duty and report this fact in forwarding the report.

If the call be for active duty in an emergency, a full report on Form 395, A. G. O., will be made in each case and forwarded, through military channels, to The Adjutant General of the Army. Should the officer be found physically unfit for any duty as an officer, any commanding officer having general court-martial jurisdiction, through whom the report passes, may relieve the reserve officer from active duty and state this fact in forwarding the report.

137. **PHYSICAL EXAMINATION WHEN RELIEVED FROM ACTIVE DUTY.**—Upon being relieved from active duty (except under the preceding paragraph), reserve officers will be physically examined as follows:

(a) Upon termination of any active duty, in time of peace, each reserve officer will be given opportunity to sign a certificate to the effect that, to the best of his knowledge and belief, there has been no material change in his physical qualifications during his tour of active duty (dates to be stated). Each officer who declines to make such certificate will be given a complete physical examination which will be recorded on Form 395, A. G. O. Certificates and Form 395 will be forwarded to the department or corps area commander to be noted. In any case in which disease or injury contracted while on active duty or disqualifying defects are recorded, Form 395 will be forwarded to The Adjutant General of the Army; otherwise certificates and forms will be filed at department or corps area headquarters.

(b) Upon termination of active duty performed during an emergency, each reserve officer will be given a complete physical examination. Report of examination will be made on Form 395, A. G. O., and will be forwarded to The Adjutant General of the Army for file with the officer's record.

## SECTION XVII

### TRAINING AND INSTRUCTION

138. **GENERAL PROVISIONS.**—The training and instruction of reserve officers divides itself broadly into two general classes—*first*, that received when they are called into active duty for that purpose, and, *second*, that received or acquired through individual interest and effort in the intervals between periods of active duty. The extent of training of the first class can not exceed 15 days per year, except with the consent of the individual reserve officer, and is further limited in practice by the funds available for pay and other expenses incident to active duty. Every effort should therefore be made to encourage the individual efforts of reserve officers while on an inactive status. To this end, corps area commanders will see that reserve officers within their jurisdiction are given every practicable assistance in their efforts at self-improvement and will employ the Regular officers and enlisted men allotted to them

for duty with the Organized Reserves in the conduct of this instruction through conferences, correspondence and such other appropriate means as may be practicable under the circumstances. The instruction imparted to reserve officers assigned to units of the Organized Reserves, whether on active duty or by correspondence or other similar means in the intervals between periods of active duty, will be directed to the end of making them effective members of effective military organizations. Through proper guidance and encouragement of individual effort the limited time available for active duty can thus be utilized as the practical culmination of progressive individual work.

139. **FIFTEEN-DAY PERIOD OF ACTIVE DUTY TRAINING.**—The maximum time that a reserve officer may be called to active duty for training in any calendar year is 15 days. Whether or not this maximum obligation is exacted in any year is dependent upon the appropriations for that year. Training programs will be determined and announced annually when appropriations have been made. So far as practicable officers assigned or attached to units of the Organized Reserves will be called out for training with their organizations. Any reserve officer subject to active duty for this 15-day training period may, upon his application, be exempted from such active duty if he has served on active duty for any purpose during the calendar year for not less than 15 days, or if, for satisfactory reasons stated by him, it is established that such active duty would work a hardship in his case.

140. **ADDITIONAL TRAINING.**—In addition to the annual 15-day training period, a limited number of reserve officers may be placed on active duty for longer periods for courses of instruction at service schools, or for duty with the Regular Army. In no case will a reserve officer be ordered to active duty for such additional training without his consent. The number and method of selection of officers for such training will be determined and announced annually, when appropriations have been made.

141. **PARTICIPATION IN REGULAR ARMY ACTIVITIES.**—Department and corps area commanders are charged with the duty of making full use of any existing opportunities within their jurisdiction which will enable reserve officers to become acquainted with activities within the Regular Establishment and to receive any possible benefit or instruction therefrom. Reserve officers should be informed by local commanding officers of events of interest taking place at any camp, post, or station near their place of residence, and invited and encouraged to attend. It is of special interest to all concerned that as many reserve officers attend drill, ceremonies, lectures, field exercises, etc., as conditions permit, and that they receive the maximum benefit therefrom.

142. **RESERVE OFFICERS AT SERVICE SCHOOLS.**—Under instructions issued from time to time by the War Department, reserve officers may attend general and special service schools, except the United States Military Academy. The numbers, branch of the service, and geographical distribution of officers to attend these schools at any time will depend upon the available funds and the accommodations at the schools, and upon the policy of securing a uniform distribution of such specially instructed officers. A limited number of students may be sent to schools for the full courses, and, in addition, special short courses designed to meet the needs of reserve officers will be conducted. The selection of reserve officers of the Territorial Assignment Group for attendance at service schools will be made by department or corps area commanders from among applicants who are recommended for such detail. Reserve officers of the General Assignment Group and Branch Assignment Group may also be selected for these courses of instruction; their applications will be forwarded through military channels to The Adjutant General of the Army.

143. **ACTIVE DUTY WITH THE REGULAR ARMY.**—Under instructions issued from time to time by the War Department, and when appropriations are available for that purpose, a limited number of reserve officers may be ordered to active duty and attached to the Regular Army for training or for other purposes. The number and class of officers to be so attached will depend upon the funds and facilities available. Applications for such duty will be made and disposed of as provided in the preceding paragraph.

144. **INACTIVE INSTRUCTION WITH THE REGULAR ARMY.**—When facilities permit, reserve officers may, on their application, be attached to the Regular Army for training and instruction at their own expense and without being placed on active duty. Such applications should be made to department and corps area commanders, and will be granted when practicable. An officer so attached will remain on inactive status and at no expense to the Government, except in so far as the use of the necessary equipment is concerned. Should a reserve officer apply to be attached to an organization outside the jurisdiction of the department or corps area commander, such commander may make the necessary arrangements by direct communication with the commander under whose jurisdiction such organization is serving. All proper steps will be taken to avoid unnecessary expense for reserve officers who seek instruction under these circumstances to give them as much instruction as possible in the time available. The efficiency reports, as required to be rendered in case of active duty, will be rendered in all cases of voluntary inactive service with organizations of the Regular Army.

145. **SMALL-ARMS FIRING PRACTICE.**—Reserve officers who have not participated in small-arms firing during the calendar year may make application to the department or corps area commander to be attached for firing to an organization of the Regular Army, or to be permitted to fire on ranges as authorized by section 113, National Defense Act, as amended June 4, 1920. Requests will be granted by department or corps area commanders when practicable. Other than the allowances of ammunition and target and range materials, no expense to the Government will be incurred, the officers remaining on an inactive status. Department and corps area commanders will require the necessary reports to be rendered in the case of each officer firing, and will cause the necessary steps to be taken to secure the insignia to which officers are entitled as a result of qualification.

146. **ARTILLERY PRACTICE.**—Reserve officers of the Artillery Sections, Officers' Reserve Corps, who have not participated in artillery practice during the calendar year, may make application to the department or corps area commander to be attached, for firing, to an organization of the Regular Army. Requests will be granted by department or corps area commanders when practicable. Other than the allowance of ammunition and target and range materials, no expense to the Government will be incurred, the officers remaining on an inactive status. Department and corps area commanders will require the necessary reports to be rendered in the case of each officer firing.

147. **USE OF ARMY AIRCRAFT BY RESERVE OFFICERS.**—The commanding officer of any Air Service station where flying is authorized may permit officers of the Air Service Officers' Reserve Corps, who have qualified for and who hold a recognized aeronautical rating, to take such flights in army aircraft as he deems advisable. Officers who make application for such flights will be required to establish their identity with the following documentary evidence:

- (a) Official identification card;
- (b) Certificate showing that the applicant is a member of the Air Service Officers' Reserve Corps in good standing;
- (c) Statement showing his aeronautical rating.

Application for the above mentioned documents will be made by officers to the corps area or department commander, who will supply same if available, or take the necessary action to have such documents furnished the applicants. A reserve officer will not be permitted to use army aircraft until he has—

- (1) Demonstrated to a flight surgeon that his physical condition is satisfactory for solo flights,
- (2) Demonstrated his ability by flights under a qualified instructor, and is reported as competent to fly alone, and



(3) Complied with all rules, orders, and regulations governing the use of army aircraft by reserve officers, including the filing of a statement that he clearly understands that flights while on inactive status are entirely at the risk of the officer and that no claim shall arise against the Government for any death, injury, or disability of any person resulting from such flights.

#### SECTION XVIII

#### PROMOTION

148. GENERAL PRINCIPLES.—The promotion system, in time of peace, for the Officers' Reserve Corps will be governed by the following general considerations:

(a) Rank and office are distinct. Officers are provided primarily to fill offices. The accompanying rank is merely that believed commensurate with the duties and responsibilities of the office. The primary requisite for the appointment or promotion of an officer is that he is capable of performing the duties and accepting the responsibilities of the *office* which he would fill.

(b) The duties of members of the Officers' Reserve Corps are divided into two general classes; one, service with troops, and the other, special service. Individual promotions are made with the particular office and class of duty in view. The continuation of officers, when promoted, in the class of duty for which they have been appointed is contemplated, but in exceptional cases promotion may be made for duty of the other class when it is clearly shown that such change is warranted.

(c) When an officer is eligible for promotion he may, upon his own initiative or upon inquiry from higher authority, signify in writing that he believes himself reasonably qualified for, and is ready to undergo, examination for promotion. Such statements will be sent through military channels to the department or corps area commander, appropriate recommendation being made by all offices through which the statement passes. Whether or not an officer will be examined will be determined by the department or corps area commander from a consideration of the statements of the officer concerned and the recommendations submitted, and whether there is a suitable assignment for the officer in the new grade.

(d) Promotion to the grade of general officer will be made only from among colonels having at least three years service as such. Such promotions will be based upon considerations of physical condition, age, interest, experience, length of service, occupational or professional standing and ability to fill the contemplated office in time of war. Promotion to general officer of the line will be made only in those cases in which ability

to command, in the field, a unit appropriate to the grade is affirmatively established. A definite assignment in the Organized Reserves must exist for each general officer of the line, except for those holding commissions in the National Guard. Promotion to general officer of the Staff will be made only upon affirmative demonstration of ability to fill the definite office and assignment contemplated in each case, the assignment being one appropriate to the rank of general officer. Applications or recommendations for promotion to the grade of general officer will be forwarded to the War Department for consideration and issuance of necessary instructions for examination.

149. **CONDITIONS UNDER WHICH A PROMOTION MAY BE MADE.**—For all sections of the Officers' Reserve Corps promotions may be made under the following conditions:

(a) The officer must signify his willingness and must be recommended to be examined for promotion.

(b) The officer must have served the prescribed minimum time in the grade from which promotion is contemplated.

(c) The officer must have satisfactorily passed his promotion examination.

(d) There must be an appropriate assignment or duty for the officer upon promotion.

150. **MINIMUM TIME TO BE SERVED IN EACH GRADE.**—To be eligible for promotion to any grade an officer must be credited with three years service in the next lower grade, *one year of which must in every case have been in the Officers' Reserve Corps since November 11, 1918.* In computing the required three years service in any grade there will be credited service in that grade in the Officers' Reserve Corps since November 11, 1918, and active service in the same or higher grade in any component of the United States Army between April 6, 1917, and December 31, 1920, double credit being given for such of the above active service as was rendered during the period of hostilities, i.e., between April 6, 1917, and November 11, 1918. Except for the one year which must have been in the Officers' Reserve Corps, there will also be credited service as a federally recognized officer of the National Guard since November 11, 1918. No service of any kind prior to April 6, 1917, is to be credited nor is any but active service between April 6, 1917, and November 11, 1918, to be credited.

151. **EXAMINATION.**—Department and corps area commanders will cause the prescribed examination for promotion to be given all officers under their administrative jurisdiction. The examinations will be held at such times as will be most suitable, taking into consideration the convenience of the Government and so far as practicable of the officers con-

cerned. The place of examination will be so determined as to provide the best available facilities for practical test. Examining boards will be furnished such records as department and corps area commanders may deem essential or advisable. War Department records will not be furnished. On the completion of an examination the department or corps area commander will forward the report of the board to the War Department with his recommendation.

152. **EXAMINING BOARDS.**—Boards will consist normally of three officers of a grade not lower than that for which the officer is being examined. If the exigencies of the service demand, boards of less number of officers may be convened. When circumstances permit reserve officers will be utilized as members of examining boards, but will not be placed on active duty for this purpose. A medical officer may be detailed as a member of the board, but this is not required, as the board may consider a report of physical examination by any medical officer of the Army of the United States.

153. **SCOPE OF EXAMINATION.**—In determining fitness for promotion the board will examine into the following in such order as it desires:

- (a) Physical fitness;
- (b) Moral character;
- (c) General fitness;
- (d) Professional fitness.

Regardless of physical or other disqualifications, the examination of each officer will be completed unless the officer upon being informed of such disqualification requests his examination be discontinued.

154. **PHYSICAL EXAMINATION.**—Each officer will be subjected to a thorough physical examination conforming to the standards prescribed by the War Department. The examination may be conducted by any suitable medical officer of the Army of the United States. The physical examination will be made as directed by the department or corps area commander, or in the absence of instructions by him as directed by the board. It may be held at any suitable place either at the time procedure for promotion is initiated or at any convenient time thereafter, to include the time of appearance before the board. The examining medical officer and the examining board may make such recommendations as they believe to be in the best interests of the service, that physical defects be waived. Physical defects must be made of record and must be made known to the officer by the examining board, who will also inform him that final decision concerning waiver of physical defects rests with the War Department.

155. **MORAL CHARACTER.**—The board will conduct a careful investigation into the moral character of the officer. The method and scope of

such investigation is in the discretion of the board, with the proviso that they make known to the officer, and give him opportunity to refute or explain any unfavorable statements of fact relative to his moral character.

156. **GENERAL FITNESS.**—The board will consider the officer's personality, appearance, tact, bearing, education, and past experience as bearing upon his general suitability for the grade under consideration.

157. **PROFESSIONAL FITNESS.**—The examination of an officer is for the purpose of testing his knowledge of the duties that may devolve upon him when promoted, and will depend upon the class of duty to which he is to be assigned. Examinations for professional fitness will be divided into two general parts.

*Part A.*—Examination in basic military subjects essential to all branches of the service.

*Part B.*—Examination in special subjects essential to the grade and office to which promotion is contemplated.

The examination will cover in general terms the basic knowledge that an officer cannot readily acquire in a short time, such as the general principles of army administration, supply, discipline, care of troops, sanitation, minor and combined tactics, principles of combat leadership, etc., to the degree that they apply to the grade and office for which the officer is being examined. Exercises and problems will not be framed so as to require knowledge or training greater than may be required of him after promotion to the next higher grade. The board will be governed by the spirit of these regulations, which is to ascertain if the officer being examined is prepared to discharge the duties that may come with his promotion, and not whether he has successfully memorized the text of regulations, manuals, etc. With respect to administrative details, only such general knowledge will be required as will demonstrate that the officer understands fully the general principles of a subject and is able to familiarize himself with the details by use of the appropriate official publications or by other means.

158. **EXEMPTIONS.**—For any portion of the examination officers will be permitted to file requests for exemption with the examining board. Claims for exemption may, in general, be granted when in the opinion of the board they are supported by a satisfactory evidence of proficiency in the subject under consideration. Exemptions granted and the basis thereof must be stated in the board's report for the information of higher authority. In acting upon exemptions, boards will consider education, experience both civil and military, and any other essential factors. The sufficiency of any statements or evidence submitted must be determined by the board.

159. **PROMOTION OF NATIONAL GUARD OFFICERS.**—The policy of the War Department regarding reserve officers who also hold commissions in the National Guard is that their commissions in both services must be in the same grade and branch. Active federally recognized officers of the National Guard will not be required to undergo additional examination for promotion in the Officers' Reserve Corps when the grade and branch to which they are to be promoted is identical with that held in the National Guard. This policy will apply to National Guard officers as long as they retain a federally recognized National Guard commissioned status.

160. **REPORTS OF BOARDS.**—Upon completion of the examination the board will prepare a report in each case embodying—

(a) The membership of the board.

(b) The conclusions of the board stated separately as to the physical, moral, general, and professional fitness for promotion.

(c) Statement of any other facts that should be of record for the information of higher authority. This statement should include information of the scope and character of the examination, the exemptions granted, and the reasons therefor.

(d) The conclusions of the board, in case the officer is found not fitted for promotion, as to his fitness to continue in his present grade.

The report of the board will be sent without delay to the department or corps area commander, who will review the proceedings and forward the same to The Adjutant General of the Army with his recommendation. Final action in each case will be taken in the personnel bureau of The Adjutant General's Office in accordance with approved policies.

161. **GENERAL SCOPE OF THE PROFESSIONAL EXAMINATION.**—For the information of the examining board and of officers to be examined, the scope which the professional examination may cover in the various sections of the Officers' Reserve Corps is stated in these regulations. The specific questions or tests to be applied are left to the discretion of the examining board, as is also the manner in which examinations are to be conducted. The examination in any subject or any part thereof may be oral, written, or practical, or a combination of these.

162. **PROFESSIONAL EXAMINATION—PART A.**—

(1) The basic subjects required for all officers being examined for promotion for "Service with troops" for all branches of the Army are as follows:

Subject.	General scope.
Administration	As much as necessary for proper performance of the duties of grade and office to which promoted.
Military law	The general provisions of the Manual of Courts-Martial covering procedure and duties of members of courts-martial, the means of disciplinary action, and their application in a unit appropriate to grade for which examined.
Military courtesy, customs of the service.	General knowledge of—to cover purpose of discipline; courtesy expected of all officers; understanding of most essential customs of the service.
Field service regulations.	Practical problems involving the fundamental principles of field operations by a unit appropriate to the grade for which examined.
Military hygiene.	General knowledge of sanitary principles; selection of camps and billets; disease preventive measures; the preservation of the health of a command.
Practical efficiency.	Demonstrated or estimated ability to command and efficiently administer a unit appropriate to grade and branch for which examined. When demonstration is impracticable, estimate will be based upon the degree of success obtained in past experience, civil and military, and the personality of the officer.

(2) The basic subjects required for all officers being examined for promotion for "Special service" are as follows:

Subject.	General scope.
Administration	General knowledge of regulations as applicable to the officer as an individual; channels of correspondence; care and use of government property in so far as applicable to the individual.
Customs of the service, courtesy, and military discipline.	An understanding of the most essential customs of the service and the courtesy expected of all officers; the purpose of discipline and the best means by which maintained.
Military hygiene.	General knowledge of personal hygiene in the field and the conservation of the health of individuals and groups.
Practical efficiency.	Demonstrated or estimated ability to put to practical use, in the capacity for which being examined for promotion, the knowledge possessed.

(3) Any of the above basic subjects also listed in Part B of the examination will be omitted from Part A, as a duplication of examination in any subject is not contemplated.

#### 163. PROFESSIONAL EXAMINATION—PART B.—

(1) The special subjects required for officers being examined for promotion for "service with troops" are as follows:

(a) *Medical Department*

(For promotion to all authorized grades)

Section.	General scope.
Medical . . . . .	Organization and administration of the Medical Service in campaign; recent progress in medicine, surgery, and hygiene with special application to the military service.
Dental . . . . .	Recent advancement in dental surgery and hygiene, especially in relation to general and military medicine.
Veterinary . . . . .	Recent progress in veterinary medicine and surgery; hygiene—animal, ment, and dairy.
Medical administrative . . .	Special examination in the subjects pertaining to the duties of individual assignment.
Sanitary . . . . .	Do.

(2) *Part B of the examination for promotion for "Special service."*—This will consist of such examination in the specialty pertaining to the office for which examined as will definitely establish the particular qualifications of the officer therefor. Except as hereinafter provided, the board will select such specialty subjects as in their judgment are necessary for this purpose.

SECTION XIX

SEPARATION FROM THE SERVICE

164. **METHODS OF SEPARATION.**—Commissions in the Officers' Reserve Corps are vacated by death, resignation, by acceptance of an incompatible office, discharge, expiration of term of commission, dropping from the rolls, or dismissal.

165. **DEATH.**—The death of a reserve officer, with place and date, will be reported by his immediate commanding officer to The Adjutant General of the Army through the department or corps area commander. All persons in the military service are enjoined to report to The Adjutant General of the Army the death of any reserve officer on inactive status coming to their notice, should they have reason to believe that such report will not otherwise be made. The members of the immediate family of a reserve officer are requested to notify The Adjutant General of the Army in case of death of such officer when on inactive status. The Adjutant General of the Army is charged with the verification of reports of death.

166. **RESIGNATION.**—Resignations will be forwarded, through military channels, to the War Department for the decision of the President. They will be tendered in letter form, will be unconditional, and will contain a statement of the reasons for which submitted. A resignation tendered under charges or for the good of the service will be forwarded,

accompanied by a full report of the circumstances, and by a copy of the charges.

167. **DISCHARGE.**—Any reserve officer may be discharged at any time in the discretion of the President. Discharges may be by reason of physical disqualification, inefficiency, or misconduct, or for the convenience of the Government or for the individual.

(a) *For Convenience of the Government.*—Requests or recommendations for discharge for the convenience of the Government will be forwarded through channels for the decision of the President. The circumstances upon which request or recommendation is based will be stated in full.

(b) *For Convenience of the Individual.*—Requests for discharge for the convenience of the individual should be in the form of resignations.

(c) *Upon Termination of National Guard Commission.*—National Guard officers who also hold reserve commissions who, upon termination of their National Guard commission, do not desire to continue in the Officers' Reserve Corps will be discharged from their reserve commissions.

(d) *For Physical Disqualification.*—For reserve officers on active duty, requests or recommendations for discharge by reason of physical disqualification will be forwarded through military channels, accompanied by a report of physical examination. For reserve officers on inactive status, requests or recommendations for discharge by reason of physical disqualification will be forwarded through department or corps area commanders, who will secure any further evidence necessary as to the physical condition of the officers, and will forward to the War Department only those cases in which discharge or transfer to another section of the Officers' Reserve Corps is recommended.

(e) *For Misconduct, Inefficiency, or Other Unfitness.*—Reports of misconduct, inefficiency, or other unfitness of reserve officers will, in time of peace, be forwarded to the department or corps area commander. The latter will cause such investigation to be made as is deemed necessary, or as directed by higher authority. If such investigation is conclusive as to unfitness to remain a reserve officer, the report thereof will be forwarded to the War Department with recommendation for discharge. In all other cases the department or corps area commander will cause to be convened a suitable board of not less than three officers to further investigate and make recommendation. The officer whose fitness is being inquired into will be informed of the alleged inefficiency, misconduct, or unfitness, and will be given opportunity for a hearing before the board, either in person, by counsel, or by brief, as he may elect. When practicable, one or more reserve officers will be included



in the membership of such boards. The board's proceedings, together with the action and recommendations of the convening authority thereon, will be forwarded to the War Department.

(f) *For Conviction by a Civil Court.*—Any reserve officer convicted of a felonious crime before any civil court shall be discharged from his reserve commission. All persons in the military service are enjoined to report, through department or corps area commanders, the conviction of any reserve officer on inactive status coming to their notice. Before forwarding such reports, department or corps area commanders will obtain such verification as may be necessary.

168. EXPIRATION OF COMMISSION.—The commission of a reserve officer terminates upon expiration of the term for which he was appointed, or upon the acceptance of an incompatible office in the military service.

169. DISMISSAL.—The dismissal or dropping from the rolls of a reserve officer on active duty is governed by the 118th Article of War.

#### SECTION XX

##### ROSTERS, RECORDS, AND REPORTS

170. RECORDS MAINTAINED BY THE ADJUTANT GENERAL OF THE ARMY.—The Adjutant General of the Army will maintain the following records:

(a) Full name, rank, branch of the service, age, address, and record of service of each reserve officer.

(b) Records pertaining to appointment, transfer, promotion, and separation from the service of each reserve officer.

(c) Rosters of all reserve officers not under the jurisdiction of department or corps area commanders for assignment.

(d) Records pertaining to the classification, efficiency, and assignment of all officers of the general assignment group.

171. RECORDS MAINTAINED BY CHIEFS OF BRANCHES.—Chiefs of branches will maintain records pertaining to the classification, efficiency, and assignment of all reserve officers of the branch assignment group.

172. RECORDS MAINTAINED BY DEPARTMENT OR CORPS AREA HEADQUARTERS.—Department or corps area headquarters will maintain, or cause to be maintained, the following records:

(a) Full name, rank, branch of the service and address of each reserve officer under the administrative control of such headquarters.

(b) A record of the assignment of each reserve officer under the administrative control of, but not subject to assignment by, the department or corps area commander.

(c) Records pertaining to the classification, efficiency, and assignment of all reserve officers of the territorial assignment group.

173. **DISPOSITION OF RECORDS IN EMERGENCY.**—When reserve officers are ordered to active duty in an emergency, records, copies, or extracts thereof pertaining to the classification, efficiency, and assignment of officers maintained at, or under the supervision of, department or corps area headquarters, will accompany the officers to their organizations or stations. Similarly, records, copies, or extracts thereof pertaining to officers of the general and branch assignment groups will, in an emergency, be forwarded by The Adjutant General of the Army and by the chiefs of branches to the immediate commanding officers to whom reserve officers report for duty.

174. **EFFICIENCY REPORTS.**—Efficiency reports will, in time of peace, be rendered on all reserve officers for each period of active duty, and for any period of instruction or observation with the Regular Army while on an inactive status. The form used (Form 711, A.G.O.) will be the same as that for officers of the Regular Army, with the exception that along the left-hand edge of the form will be stamped or written in red the word "RESERVE" in letters not less than one-half inch in height. The notation "Reserve" will be made on both the front and reverse sides of the form. An abbreviated report (par. 2, instructions on Form 711, A. G. O.) may be rendered in those cases in which more complete information is not available. Entries will be made in all spaces provided on the form in so far as is applicable and the knowledge of the reporting officer permits. Reports will be rendered at the termination of the period of active duty for which the officer has been called, and will be forwarded to and filed in the office having assignment jurisdiction over the officer. Efficiency reports on reserve officers are to be rendered by the officer who, in each case, is best qualified to observe the performance of the duty upon which the report is based. Corps area or subordinate commanders will, when reserve officers in considerable numbers are called to active duty for training, cause to be designated, before the beginning of the period of active duty, the officers who are to prepare efficiency reports. Efficiency reports pertaining to reserve officers not on active duty are not, in general, required, but may be rendered annually, or at any time, by their immediate superiors when, in the opinion of the reporting officer, the latter has information which is a proper basis for a report that should be rendered. In time of war efficiency reports for reserve officers on active duty will be rendered as required for all other officers of the Army.

175. **PREFERENCE REPORTS.**—At the time of appointment each reserve officer is given opportunity to submit a personal report and state-

ment of preferences (Form 423a, A. G. O.). No periodical preference report is required thereafter. A reserve officer may, at any time, submit to the department or corps area commander, by letter, any change or statement of preference for assignment or duty. Such letters as cannot be suitably acted upon or recorded by department or corps area commanders will be forwarded to the War Department.

176. **PERSONAL REPORTS.**—No periodical personal report is required; reserve officers are enjoined to forward for file with their classification and efficiency records, at any time, information concerning themselves bearing upon their qualifications or efficiency that they desire filed. A prompt personal report is required whenever the reserve officer becomes, or ceases to be, an officer, warrant officer, or enlisted man of any other military or naval force, or when he assumes or vacates any public or civil office under the Federal Government to which elected, or to which appointed by the President by and with the advice and consent of the Senate.

177. **CHANGE OF ADDRESS.**—In the event of a temporary change of address, each reserve officer should make the necessary arrangements to have forwarded to him any orders or communications received at his permanent address. In the event of a permanent or prolonged change of address, each reserve officer will forward prompt notification thereof to The Adjutant General of the Army through military channels, including in all cases the commander of the department or corps area. Reports covering absence from the United States will be rendered as provided in paragraph 178.

#### SECTION XXI

#### MISCELLANEOUS

178. **ABSENCE FROM THE UNITED STATES.**—A commission in the Officers' Reserve Corps places no restriction on travel or residence abroad. Reserve officers who intend to leave the continental limits of the United States for travel or temporary residence abroad, and who will be absent more than 30 days, will notify The Adjutant General of the Army, through military channels, of the place, approximate date, and duration of their travel or residence abroad. Such reports for periods of less than 30 days are not required, but steps should be taken by the officer to insure his being promptly reached through his permanent address, if necessary. It is desirable, both from the viewpoint of the Government and the officer concerned, that a reserve officer traveling or temporarily residing abroad report his presence and address in any foreign country to the nearest United States military attaché. Upon the expiration of the five-year period of the commission of a reserve officer residing abroad

the circumstances of his foreign residence, his qualifications, and availability for training will be considered in determining whether or not he will be reappointed.

179. **TYPHOID PROPHYLAXIS AND VACCINATION.**—The inoculation against typhoid-paratyphoid fevers and vaccination against smallpox is required of all reserve officers who are ordered to active duty in an emergency. All reserve officers are urged to be inoculated when on an inactive status, and for this purpose may apply to the surgeon of any army station for such inoculation. The inoculation will be accomplished if practicable, and upon completion thereof a certificate will be given the reserve officer by the surgeon showing the name, rank, and branch of the service of the reserve officer, nature of inoculation, and date of completion. This certificate will be preserved by the officer and presented to the proper authority when called into active service as his evidence of such inoculation.

180. **ENLISTMENT IN THE REGULAR ARMY, NATIONAL GUARD, OR IN ANY OF THE ARMED FORCES OF THE UNITED STATES.**—Any reserve officer who enlists in the Regular Army, National Guard, or other armed forces of the United States, not specifically exempted herein, will not vacate his reserve commission by such enlistment. Any reserve officer who enlists in the Navy, Marine Corps, Coast Guard, Revenue Cutter Service, or the Naval Reserve Force will be discharged from his reserve commission.

181. **APPOINTMENT OF OFFICERS OF THE REGULAR ARMY, ETC.**—No person serving as an officer of the Navy or Marine Corps, or as a cadet at the United States Military Academy or Naval Academy, shall be appointed or hold a commission as a reserve officer. Any reserve officer who accepts an appointment as a commissioned officer of the Regular Army thereby vacates his reserve commission.

182. **UNIFORM REGULATIONS.**—All reserve officers will provide themselves with field uniforms pertaining to their grade, as prescribed in uniform regulations.

(a) Reserve officers will wear the uniform at all times on active duty in accordance with such regulations as are in force at the time of their service.

(b) Reserve officers not on active duty, and within the United States or its possessions, may wear the uniform on occasions of military ceremony, and when engaged in the military instruction of a cadet corps or similar organization, or when responsible for the military discipline at an educational institution. Reserve officers may also wear the uniform when attached to an organization for target practice, or when visiting a military station for participation in military drills or exercises.

(c) Reserve officers outside the United States or its possessions will not, except when granted authority, wear the uniform when on an inactive status. Such officers, on occasions of military ceremony or other military functions, may, upon reporting to the nearest military attaché and having their status accredited, be granted authority to appear in uniform.

(d) Field clerks, warrant officers, and enlisted men of the Regular Army and National Guard, who also hold commissions in the Officers' Reserve Corps, will not wear the uniform of their grade in the Officers' Reserve Corps except when called to active duty as reserve officers.

(e) A lapel button for optional wear on civilian clothes by members of the Officers' Reserve Corps is authorized. The specifications are as follows:

A circular button of gold or gilt one-half inch in diameter, with face enameled in the color of the facings of the arm or corps, surrounded by a narrow circle of gold or gilt, with the letters "U. S. R." in the center. These letters to be in gold or gilt when there is but one color in the center. These letters to be in gold or gilt when there is but one color in the facings; when there are two colors, the letters will be in the color of the piping or second color.

**183. PURCHASE OF NECESSARY UNIFORMS, ACCOUTERMENTS, AND EQUIPMENT.**—Necessary uniforms, accouterments, and equipment may be purchased by reserve officers when on active duty, after proper identification, at the same price and under the same rules and regulations as govern such sales to officers of the Regular Army, so far as applicable. Necessary uniforms, accouterments, and equipment may be purchased, after proper identification, by reserve officers not on active duty in such quantities as would be required immediately by them when called into active service. In making purchases the following will govern:

(a) Reserve officers not on active duty, who reside near a depot sales store or other point of supply, may, upon identification, make purchases in person.

(b) Reserve officers not on active duty, who do not reside near a depot sales store or other point of supply, may submit written requests for purchases to the officers in charge of depot sales stores, or other supply points. All requests for purchases must be accompanied by proper means of identification establishing the fact that the person making the request is an officer of the Officers' Reserve Corps. The officer making the request will certify therein that the articles are for his own personal use, and that application to purchase is made under paragraph 1174, Army Regulations, as amended. The request will list the articles desired and will state what number of articles requested, if any,

have been previously purchased from the United States Government. The officer will be informed what articles desired are available, the cost thereof and the manner in which payment should be made. Upon payment in accordance with instructions, the articles will be shipped.

(c) With the exception of clothing and ammunition, sales of more than one article or set of equipment to an officer will not be made unless he can establish, by suitable evidence, the loss or destruction, through no fault of his own, of such articles previously purchased by him.

(d) Supply offices will maintain records of all articles having serial numbers sold to reserve officers.

(e) Information concerning cost of articles, packing, etc., can be obtained from department or corps area headquarters, military stations, or from officers in charge of depot sales stores or other points of supply.

184. PURCHASE OF SUBSISTENCE STORES.—Subsistence stores, when available, will be sold by the Quartermaster Department at cost price, for cash, in reasonable quantities to officers of the Officers' Reserve Corps while on active duty and to their dependents during their absence upon written authorization to the quartermaster. Sales will be made to the foregoing only after proper identification and on his or her certificate that the stores are for his or her personal or family use.

185. ISSUE OF ARMS AND EQUIPMENT WHEN CALLED TO ACTIVE DUTY.—Regulations provide that reserve officers, when called to active duty, are entitled to the privilege of obtaining, on memorandum receipt, all necessary arms and equipment except necessary clothing.

186. MEDICAL TREATMENT.—Reserve officers not on active duty, voluntarily participating in aerial flights or other training authorized by the War Department, will, when injured or taken sick while on such voluntary duty, be admitted to army hospitals and, when so admitted, will be on the same status as civilians on the footing of officers. Hospital charges will be as prescribed from time to time in Army Regulations.

187. MILITARY CORRESPONDENCE.—All reserve officers must answer communications promptly, and in replying or forwarding original communications great care must be exercised to see that their full name, grade, and section are legibly stated. Correspondence will be conducted as prescribed in Army Regulations. Except when otherwise authorized, all official communications intended for the Secretary of War or for any bureau or office of the War Department will be in writing and addressed to The Adjutant General of the Army. In orders, correspondence, etc., members of the Officers' Reserve Corps are referred to and their rank indicated as set forth in the abbreviations in Section III of these regulations. Example:

Captain John Smith, Quartermaster Officers' Reserve Corps; or  
 Captain John Smith, QM-ORC.  
 Major James Doe, Air Service Officers' Reserve Corps; or  
 Major James Doe, AS-ORC.

188. BOOKS AND PUBLICATIONS.—Lists of War Department documents and War Department pamphlets on military training, with the regulations governing distribution, are published by The Adjutant General of the Army. Economy demands that the supply of publications to individual reserve officers be limited to those cases in which publications furnished the organizations to which they are assigned are not available for their use. In general, publications are supplied to individuals only on the request of the individual. Officers desiring to purchase books and publications may obtain them from the Superintendent of Documents, Washington, D. C. Reserve officers are urged to subscribe for the service journals published by the different branches of the service and other military publications in order to keep well posted regarding changes and new policies affecting the Army. General and special service schools maintain mailing lists, and some of them also conduct correspondence courses and book departments. Service schools will place the names of all reserve officers, who apply, on their mailing lists. The names of such reserve officers will be kept on such lists until removal is requested by the officers or until they become delinquent in the payment of their accounts to the school.

189. CERTAIN APPOINTMENTS RESTRICTED.—An officer or employee of the United States or the District of Columbia shall not be appointed in or permitted to hold a commission in the Officers' Reserve Corps without the consent of the head of the executive department in which employed.

# APPENDIX I

## APPLICATION FOR APPOINTMENT IN THE OFFICERS' RESERVE CORPS.

(To be typewritten when practicable.)

.....		
(Place)		
.....		
(Date.)		
From.....	.....	.....
(Surname.)	(Christian name in full)	(Number and street or rural route.)
.....	.....	.....
(City, town, or P. O.)	(County.)	(State.)
To: The Adjutant General of the Army, Washington, D. C.		
(Through department or corps area commander.)		
Subject: Application for appointment in the Officers' Reserve Corps.		

I hereby make application for appointment as.....

(Grade.) (Section.)

in the Officers' Reserve Corps, preferably for.....

("Service with troops,"

or "Special service.")

In connection with the application I submit the following information, which I certify to be correct to the best of my knowledge:

1. State whether or not you are at present a member of the Regular Army, National Guard, or Enlisted Reserve Corps; if so, which, giving organization, branch of service, rank or grade.

2. State the date and place of birth.

3. State whether or not you are a citizen of the United States and whether by birth or naturalization. (If the latter, append evidence of naturalization.)

4. State your principal occupation and positions you have held, giving names of companies or firms, dates, and any other details you desire considered.

5. Give a statement of your military experience. (Regular Army, National Army, National Guard, military schools, or other military training, showing grades.)

6. Remarks: State any other information you may desire to submit for consideration.

.....  
(Signature of applicant.)

#### NOTES

(a) This form is not printed or distributed by the War Department. It is published here as a guide to applicants in *preparing* applications.

(b) This form of application is for persons who may be appointed upon an examination of records only, as provided in Sections IX, X, XI, and XII, these regulations.

(c) Applications will be accompanied by a report of physical examination on Form 395, A. G. O., which may be obtained from any military post or station. Physical examination should be preferably by a medical officer of the Regular Army, Officers' Reserve Corps, or National Guard.

(d) If in the military service, application will be forwarded through military channels.

(e) If appointment is sought with a view to assignment to a particular unit of the Organized Reserves, that fact will be stated under "Remarks."



APPENDIX II

APPLICATION FOR EXAMINATION AND APPOINTMENT IN THE OFFICERS'  
RESERVE CORPS

(To be typewritten when practicable.)

.....  
(Place.)  
.....  
(Date.)

From: .....  
(Surname.) (Christian name in full) (Number and street, or rural route.)  
.....  
(City, town, or P. O.) (County.) (State.)

To: The Commanding General.....  
(Department or corps area )

Subject: Application for examination and appointment in the Officers'  
Reserve Corps.

I hereby make application for examination and appointment as .....  
(Grade.)  
..... in the Officers' Reserve Corps, preferably for  
(Section.)  
.....  
("Service with Troops," or "Special Service.")

In connection with the application, I submit the following information which I certify to be correct to the best of my knowledge.

1. State the date and place of birth.
2. State whether or not you are a citizen of the United States and whether by birth or naturalization. (If the latter, append evidence of naturalization.)
3. State the schools you have attended, number of years at each, whether a graduate or not, and degrees, if any. State membership in professional societies.
4. State your principal occupation and positions you have held, giving names of companies or firms, dates, and any other details you desire considered.
5. State your military experience, if any. (Regular Army, National Army, National Guard, military school, or other military training, showing grades.)
6. Remarks: State any other information you may desire to submit for consideration.

.....  
(Signature of applicant.)

NOTES

(a) This form is not printed or distributed by the War Department. It is published here as a guide to applicants in *preparing* applications.

(b) This form of application is for persons who may be appointed after satisfactorily passing the examination for appointment as provided in Sections VII, VIII, X, and XIII, these regulations.

(c) Applications may be accompanied by a report of physical examination on Form 395, A. G. O., which may be obtained from any military post or station. Physical examination should be preferably by a medical officer of the Regular Army, Officers' Reserve Corps, or National Guard.

(d) If appointment is sought with a view to assignment to a particular unit of the Organized Reserve, that fact will be stated under "Remarks."



## BOOK REVIEWS

ROOSEVELT IN THE BAD LANDS, by Herman Hagedorn. New York: Houghton Mifflin Company, 1924. Price, \$5.

We can say, without much exaggeration, that Mr. Hagedorn has written an autobiography of Colonel Roosevelt so far as relates to the Colonel's western life and experiences. It is a fascinating story, as must be almost anything which has as its center this dominating character. In his preface Mr. Hagedorn says that he has consulted all written records which were available and has also talked with as many of Colonel Roosevelt's associates as it was possible to get into communication with. There is ample evidence of this, as the smooth sequence of what he has written shows. From the standpoint of cold materialism, measured by dollars and cents, Colonel Roosevelt's cattle ventures at Medora were not a success. He sank more money in the sunbaked, blizzard-swept fastnesses of the Bad Lands than he ever recovered from them. It is not by that standard, however, that we must measure the value of his experiences in the cow country. Of far more worth to him, and through him to those over whom he was later to preside, was the training, both physical and mental, which accrued to him through those strenuous days of the round up and the hunt.

First landing at Little Missouri as a rather slight and typically eastern product, he soon grew to be "Old Four Eyes" instead of "Four Eyes," a distinction with a difference, as Mr. Hagedorn points out. The indomitable courage and persistence of the man was evident from the very beginning when, in his first buffalo hunt, he tired out his guide each day and then sat up all hours of the night and argued with his Scotch acquaintance, Gregor Lang.

The magnetism of the man was soon felt by those who came in contact with him, the same charming magnetism which attracted to him all those who were privileged to know the real man; and it was a magnetism which drew to him both the good citizen and the bad and made the good better and the bad less bad.

The picture which Mr. Hagedorn draws of the Bad Lands is very true, both as to the characters which lived there and as to the country itself. I cannot help being impressed with the vividness of the description when looking back over days spent in that section of the country. I think that it must in this way appeal to any who have lived in that strange, fascinating, ungodly, beautiful section of the United States.

The book is much more than an account of Colonel Roosevelt's vicissitudes while he was ranch boss, cowboy and hunter. It is a lesson in courage, determination, patience, true democracy and righteous living which is a good pattern for any citizen of our republic to follow. The description of that strange, autocratic visionary, the Marquis de Mores, is interesting, and the contrast of his character with that of Roosevelt is illuminating. The insight into the character of the colonel's friends and companions is absorbing, and excerpts from their letters and his letters about them are interesting in the extreme. These extracts are judiciously made by Mr. Hagedorn and never out of place or tiresome. Nothing which deals with the buoyant, joyous life of this great American of ours can ever be prosaic or dull. His eager zest for life, his restless energy in extracting from it the most which it had to give, must always be a romance, and further than that, a lesson to be carefully con-

by those who would follow fearlessly a straight path through life. The book is well thought out and very well worth reading.

I have only two very minor criticisms to offer: one whimsical, the other not. In speaking of "Bill" Williams' saloon, Mr. Hagedorn says, "The doors were never closed and the faro wheel seldom silent." Looking back over the unregenerate days of my youth, I plainly recall the "case cards," the "coppering" of bets, and even the "lookout" on his high stool, but if my memory serves me right, we never played faro with a wheel. As to my serious objection, in one of the latter chapters Mr. Hagedorn says that there were better reasons for making Colonel Roosevelt Governor of New York than the fact that he had "led an aggregation of untamed gunmen in Cuba."

In the western parlance of my day, "gunman," "gunfighter" and "bad man" were at least first cousins, and as the junior surgeon of this "aggregation" (The Rough Riders) I feel that I am privileged to protest against this sweeping denomination of what was in reality and, in the main, an orderly and disciplined body of troops.

Furthermore, I am here to assert, and I am sure "The Colonel" would back me up, that nothing whatever which he commanded was in any way "untamed."

However, if Mr. Hagedorn plays his faro with a wheel, I suppose it is charitable to conclude that he is still enough of a "tenderfoot" to miss some fine distinctions in his substantives and adjectives. Anyhow, let's forgive him these very modest variances and be grateful that he has given to us so creditable a book.

JAMES RONN CHURCH.

**DISEASES OF THE CHEST AND THE PRINCIPLES OF PHYSICAL DIAGNOSIS**, by George W. Norris, A.B., M.D., Assistant Professor of Medicine in the University of Pennsylvania, and Henry R. M. Landis, A.B., M.D., Assistant Professor of Medicine in the University of Pennsylvania, with a chapter on Electrocardiograph in Heart Disease, by Edward Krumbhaar, Ph.D., M.D., Assistant Professor of Research Medicine in the University of Pennsylvania. Second edition, thoroughly revised. Octavo volume of 844 pages with 433 illustrations. Philadelphia and London: W. B. Saunders Company, 1920. Cloth, \$9.50 net.

That the medical profession was quick to recognize the merit of this book is evidenced by the exhaustion of the first edition within less than two years. Over 250 pages are given over to physical diagnosis of the lungs and of the circulatory system. Special emphasis is placed upon the subject of diagnostic acoustics, the perfect understanding of which is so important in the correct interpretation of the physical findings in chest examinations. The subject matter is profusely illustrated to clarify and demonstrate the points made by the authors, and for further emphasis actual photographs of post-mortem specimens preserved in formalin are reproduced, preserving the anatomical relationships. The descriptions are complete, concise, and practical to the end of making the text an authoritative presentation of the modern accepted views on the interpretation of the physical signs of the diseases of the chest. There is added a chapter on the electrocardiograph written by Dr. Edward B. Krumbhaar that gives a brief but adequate explanation of the method of production and an interpretation of the electrocardiogram in diseases of the heart.

Diseases of the bronchi, lungs, pleura, diaphragm, pericardium, heart, and aorta are fully described to include the most recent work done along those lines, and the many references to medical literature give evidence of the authors having taken pains to make their work complete and up to date. New material has been added to this edition, among the subjects added are Spirochetal Bronchitis, Influenza,

*Streptococcus Empyema, Chronic Inflammatory Conditions of the Lungs, of Uncertain Etiology, Calcification of the Lungs, Pneumopericardium, etc.*

Complete and carefully prepared works such as this are always welcome and stand out in contrast to the hastily prepared and inconsequential books that flood the book mart. The highest praise is due the authors for this book of merit, a popularity exceeding that of the first edition may be predicted.

L. A. NEWFIELD, M.D.

**ACUTE EPIDEMIC ENCEPHALITIS (Lethargic Encephalitis).** An investigation by the Association for Research in Nervous and Mental Diseases. Report of the Papers and Discussions at the meeting of the Association, New York City, December 28 and 29, 1920. Prepared under the direction of Walter Timme, M.D.; Pearce Bailey, M.D.; Lewellys F. Barker, M.D.; Sanger Brown, 2d, M.D.; Charles L. Dana, M.D.; J. Ramsey Hunt, M.D.; Foster Kenedy, M.D.; George H. Kirby, M.D.; Hugh T. Patrick, M.D.; Bernard Sachs, M.D.; William G. Spiller, M.D.; Israel Strauss, M.D.; E. W. Taylor, M.D.; Frederick Tibney, M.D.; T. H. Weisenburg, M.D. Pp. 258. Price, \$2.50. Paul B. Hoeber, 1921.

This book is presented to the medical profession by the Association for Research in Nervous and Mental Diseases and embodies the present-day knowledge of a disease that is engaging the attention of the medical profession of the world. Much has been written concerning Lethargic Encephalitis, and the widespread interest is indicated by the literature written on the subject. To summarize the contributions on the subject to the present and to present an account that will be representative of the profession of America is the purpose of this book. The subject matter is presented in a way that differs considerably from the usual medical book. Each chapter is devoted to a particular phase of the subject as contributions by several authors and is followed in each instance by a series of questions submitted by the commission of the association and answered by the author. The conclusions presented by the commission follow each contribution.

Of particular interest is the chapter on Bacteriology and Animal Experimentation which gives a full description of the experimental work that has been done to determine the bacteriology and pathogenesis of lethargic encephalitis. "The work done by Loewe and Strauss in ascribing the etiology of the disease to a living specific infectious agent" is described by these authors in detail. "Thalhimer in this country has confirmed the experimental results claimed by these authors, and in Europe this has been done by Levaditi and Harvier, McIntosh and Turnbull and Ottolenghi, D'Antona and Tonietti. The commission gives high commendation to the effort of the American research workers as having apparently established a relationship between the organism and the disease.

This volume is one that no one interested in clinical medicine can afford to do without and represents the knowledge of lethargic encephalitis held by the medical profession of this country.

L. A. NEWFIELD, M.D.

**A SYNOPSIS OF MEDICINE,** by Henry Letheby Tidy, M.A., M.D., B.Ch. (Oxon.), F.R.C.P. (Lond.), Assistant Physician to St. Thomas' Hospital; Physician to the Great Northern Hospital; formerly Assistant Clinical Pathologist and Medical Registrar to the London Hospital. New York: William Wood and Company. Pp. 952. Price, \$6.50.

To the long list of books on medicine already published, this volume is a welcome addition. The book follows the same general plan of Hey Groves' "Synopsis of

surgery, to which this is a companion volume, and it should prove equally as popular. The aim has been to provide a means for a rapid yet complete review of any subject in medicine by the busy practitioner and by the student confronted with examinations. There has been no sacrifice of accuracy or completeness for the sake of brevity, nor is there here a bare outline of a few essentials. On the contrary, the descriptions are complete and concise, and sufficient explanations of disputed points in the field of medicine are given the reader.

The subject matter follows Osler's "Principles and Practice of Medicine," though several portions have been rearranged, especially the sections on Diseases of the Nervous System, Diseases of Metabolism, the Alimentary System, of the Blood, and of the Circulatory System.

There is an index of forty pages that enhances the value of the book.

L. A. NEWFIELD, M. D.

URINARY ANALYSIS AND DIAGNOSIS, BY MICROSCOPICAL AND CHEMICAL EXAMINATION, by Louis Heitzman, M. D., New York, formerly Professor of Pathology and Bacteriology, Fordham University School of Medicine, Fordham, N. Y. Fourth revised and enlarged edition, with 131 illustrations, mostly original. Pp. 362. Price, \$4.00. New York: William Wood & Company, 1921.

This practical treatise on urine analysis has been revised to include chemical tests that have proved to be useful and practical. A chapter has been added on the subject of functional renal tests that are used to determine kidney efficiency as an aid to diagnosis of diseases of the kidney. The author lays stress on the microscopical examination of urine, believing that by this important procedure the site of a lesion of the urinary tract can be definitely located and a picture of the pathology formed. Microscopic examination of urine is frequently performed in a perfunctory manner, and it is by stressing its importance and pointing out how valuable conclusions can be drawn that the author points out that a diagnosis can often be made when clinical symptoms are vague. The illustrations are original, for the most part, and are clearly drawn to show the condition described and as actually seen under the microscope.

The medical profession and those interested in laboratory work have already recognized the value of this book. Its practical character will appeal to everyone who does urine analysis, and its frequent consultation cannot but serve to make such analyses more than a dull routine. Every laboratory should have a copy of this book for ready reference.

L. A. NEWFIELD, M. D.

PRINCIPLES OF MEDICAL TREATMENT, by George Cheever Shattuck, M.D., A.M., Assistant Professor of Tropical Medicine, Harvard Medical School; Formerly Assistant Visiting Physician, Massachusetts General Hospital. Fifth revised edition, octavo, 320 pages. Price, \$3.50. Boston: W. M. Leonard, Inc., 1921.

The present edition represents a much larger volume than the first one issued by the author several years ago. To this volume there have been contributions by John B. Hawes, 2d, M.D., on Tuberculosis, Edwin H. Place, M.D., on Acute Infectious Diseases Most Common in Childhood; Gerald Blake, M.D., on Influenza, Benjamin H. Ragle, M.D., on Diabetes Mellitus, and Henry M. Thomas, Jr., M.D., on Serum Treatment of Pneumonia.

The first edition represented that the work was an attempt to offer clearly and concisely sound principles of treatment based on known pathology. This aim has

been carried out in enlarging the book to include such subjects as disorders of the circulatory system, nephritis, acute infectious diseases, acute infections of the respiratory tract, influenza, pulmonary tuberculosis, gastro-intestinal disorders, and diabetes mellitus. There is added a chapter on medication that indicates the important drugs and the preparation of each believed to be most generally useful. The book can be heartily recommended as one that embodies the present-day knowledge of the principles of medical treatment, the complete understanding and application of which underlies the successful management and treatment of diseased conditions.

L. A. NEWFIELD, M.D.

**THE MICROTOMIST'S VADE-MECUM: A Handbook of the Methods of Microscopic Anatomy**, by Arthur Bolles Lee, Hon. F. R. M. S. Eighth Edition. Edited by J. Bronte Gatenby, B. A., V. Sc., D. Phil. (Oxon), D. Sc. (London), F. R. M. S. With the collaboration of W. M. Payliss, M. A., etc.; C. Da Fano, M. D., etc.; A. Drew, D.Sc., etc.; W. Cramer, Ph.D., etc.; and J. Thornton Carter, F. R. M. S. Philadelphia: P. Blakiston's Sons and Co., 1921. Cloth, pp. 1-594. Price, \$6.50.

The present edition of this valuable handbook on the methods of microscopic anatomy has been practically prepared by Dr. Gatenby, and he is to be congratulated in placing in the hand of the student and research worker this very up-to-date and excellent edition. The worker in the pathological and anatomical laboratory has long been acquainted with "The Microtometist's Vade-Mecum," as is evidenced by the appearance of an eighth edition, and this edition is much superior in the value of its contents to any that has preceded it.

It may be stated that every technical method employed in the killing, fixing and hardening, imbedding and staining of anatomical material, including special methods of injection, embryological methods, cytological methods and staining methods employed in the study of special tissues, as the connective tissues, blood, and nervous system, is included in this remarkable volume and fully described. In addition the special methods which have been found most useful in the study of invertebrates, as the arthropoda, vermes and protozoa, are carefully described.

The method of description employed in the work is excellent. Under each special subject there is a general discussion, followed by the various methods used in preparation and staining, in which the method of preparing the reagents mentioned is fully given, with references to the literature. With many of the staining solutions enumerated there are described the color reactions that may be expected with the stain when used on various tissues, but it is noted that this very important feature is omitted frequently. If one may venture a suggestion for the new edition that will undoubtedly be called for in time, it is that after every stain described there be given the color reactions that it causes when used with various tissues.

This work is a veritable encyclopedia of the methods employed in the study of microscopic anatomy and should be in the possession of every student of the subject and in the hands of every research worker. In it are found the most valuable methods used in the study of this subject and an immense amount of material that cannot be found elsewhere without the expenditure of much patience and time. The references, numbering into the thousands, to the literature of the subject greatly increase the value of the work, especially to the research worker. The book is well printed on excellent paper and strongly bound.

CHAS. F. CRAIG.

THE INTESTINAL PROTOZOA OF MAN, by Clifford Dobell, M.A., F.R.S., and F. W. O'Connor, M.R.C.S., eds. Published for Medical Research Council. London: John Bale, Sons and Danielsson, 1921. Pp. 1-211. Illustrated. Price, 15 shillings.

All medical men who have been interested in the parasites that occur in the human intestine, whether pathogenic or non-pathogenic, have felt the need of an authentic work upon them, a work that would embody all the important recent knowledge that has been acquired as one of the results of the World War and written by some one well grounded in protozoology and well equipped, through personal experience with the organisms described, to sift from the mass of material in the literature the really essential facts of importance to the medical man and research worker. Therefore it is a great pleasure to review Dobell and O'Connor's "The Intestinal Protozoa of Man," for this book answers the need mentioned above in every particular.

The book, written, as it is, by a protozoologist and a medical man, is most accurate in its descriptions of the protozoa considered and of the effects produced by them, and the discussions regarding treatment are valuable, interesting and conservative. The work is divided into nine chapters as follows: I. Introduction; II. The Intestinal Amebae of Man; III. Amebiasis; IV. The Intestinal Flagellates of Man; V. The Intestinal Coccidia of Man; VI. The Intestinal Ciliates of Man; VII. The Diagnosis of Intestinal Protozoal Infections; VIII. The Treatment of Intestinal Protozoal Infections; IX. The Coprozoic Protozoa of Human Feces. In addition there is a complete bibliography of the more valuable and important papers upon the subject and an excellent index.

In the discussion of the intestinal amebae of man the authors recognize and describe five species: *Entamoeba histolytica*; *Entamoeba coli*; *Endolimax nana*; *Iadamoeba butschlii* and *Dientamoeba fragilis*. Each of these parasites is briefly but adequately described and the most important differential features noted. The reviewer regrets that the authors did not see fit to adopt the generic name *Endamoeba* rather than *Entamoeba*, for though opinions may differ as to the proper generic name, in view of the fact that it has never been proven that the ameba of the cockroach belongs to a different genus than the amebae of man placed in the genus *Entamoeba*, the generic term employed by Leidy of *Endamoeba* for the ameba of the cockroach, should by reason of its priority be applied to *histolytica* and *coli*, at least.

In the chapter devoted to intestinal flagellates the following parasites are considered: *Giardia intestinalis*, *Trichomonas hominis*, *Chilomastix mesnili*, *Embadomonas intestinalis*, and *Enteromonas hominis*. The descriptions of the organisms are condensed but contain every thing of importance, and the discussions of classification and history are critical and will prove of great interest to the research worker and protozoologist.

The chapters devoted to the intestinal coccidia and ciliates are excellent and contain a great deal of information in a comparatively small space. The authors accept the following coccidia as parasites of man: *Isospora hominis*, *Eimeria tenyoni*, *Eimeria oryzipora*, and *Eimeria snijdersi*, and the following ciliates: *Balantidium coli*, *Balantidium minutum*, and *Nyctotherus faba*.

The disease conditions brought about by infection with the intestinal protozoa are well described and the relation of *Entamoeba histolytica* to the lesions characteristic of amebic dysentery is discussed in an able manner and will well repay reading. The question of "carriers" of *Entamoeba histolytica* is thoroughly considered. The authors do not believe that there is yet any good evidence proving that any of the



intestinal flagellates are pathogenic but that "there is very considerable evidence to show that most and probably all of them are harmless." It is doubtful if this belief will be shared by many practitioners in tropical regions where infection with *Giardia intestinalis* is frequently encountered and where massive infections undoubtedly cause severe attacks of diarrhea and even symptoms of dysentery.

The chapters upon diagnosis and treatment are all that could be desired. The methods advocated for the demonstration of the various protozoa of the intestine are those that have been found most useful by the authors and, if followed, will be found to give good results. The pages upon common sources of error in diagnosis and the clinical interpretation of the protozoological findings are very valuable and filled with good advice to the physician and student. The authors believe that the majority of persons infected with *Endamoeba histolytica* can be radically cured of their infection by treatment with emetine hydrochloride or emetine bismuthous iodide, but they admit that there are certain cases which are absolutely refractory to treatment.

The book is illustrated with eight plates, seven of which contain three full-page plates. These plates are most excellent and will be found very useful in diagnosis, especially Plate VIII, which illustrates, by means of three full-page drawings containing numerous figures, the morphology of the cysts of the intestinal protozoa as observed in fresh living preparations, in iodine preparations and in preparations stained with iron-hematoxylin.

The reviewer believes this is a work that should form a part of the library of every student and practitioner of medicine and one that can be cordially recommended as a thoroughly scientific discussion of a very important group of human parasites.

CHAS. F. CRAIG.

AN INTRODUCTION TO THE HISTORY OF MEDICINE; with Medical Chronology, Suggestions for Study and Bibliographic Data, by Fielding H. Garrison, A.B., M.D., Lieut. Col., Medical Corps, U. S. Army. Third edition, enlarged and revised. Philadelphia and London: W. B. Saunders Company, 1921.

The former editions of this work occupied a place quite uniquely their own, and in this last printing we have what was already in them plus further matter which Colonel Garrison has added. It is scarcely necessary to speak of a volume so well known to medical men, something to which the man in doubt as to authors or procedure can turn with the certainty of finding the information which he seeks.

In this last edition Colonel Garrison himself sums up in his preface the changes made. He says: "A careful account has been rendered of the newer findings of Sudhoff, Neuburger, Wickersheimer, Singer and other European investigators of ancient and medieval medicine; new matter has been added on the doctrine of the origin and transmission of ethnic culture (convergence and convection); on Chinese medicine; on the history of pediatrics, dentistry, public hygiene, military medicine and medical lexicography; on the earlier nuclei of medical education in the United States; on recent Japanese, Spanish and Latin-American medicine; and on the work of the medical departments of armies in the European War. A number of new biographical sketches have been added, with portraits of Symphorien Champier, Villemain, Gurlt, Littré, Salkowski, Osler, Max Neuburger and others. Errors of omission and commission have been corrected; the bibliographies at the end of the volume have been enlarged and improved; and the author index has been made as complete and exhaustive as possible."

The medical profession, particularly those interested in the historical side, owe a very real debt to Colonel Garrison because, by his patient research and discerning

selection, he has made available for them in one complete and convenient volume a mass of data which otherwise would have required tedious and oftentimes impossible library research. The book is well printed and well illustrated, one which is creditable in appearance as well as valuable for what is between the covers.

JAMES ROHR, CHURCH

X-RAY AND RADIUM IN THE TREATMENT OF DISEASES OF THE SKIN, by Dr. George M. MacKee. Lea & Febiger, 1921.

This is a book of 600 pages, well illustrated, with excellent plate work. It is carefully indexed.

The treatment of diseased conditions by X-ray and radium has attracted the attention of the profession for many years. Particularly is this true of diseases of the skin. Medical literature, more particularly in those publications devoted to X-rays and radium, has been crowded with articles bearing on this subject, of more or less value; some conservative, some positively dangerous.

Until the publication of Dr. MacKee's book there has been no recent summary, no complete statement of the known facts of irradiation. This book supplies these facts in clear and unmistakable language. Associated with the known, there is a minimum presentation of the factors of irradiation that still remain unsettled, in the domain of judgment, sometimes of speculation. In every instance the author has with meticulous care labeled his remarks defining the known from theory.

The subject is presented as a whole. The book starts with an invaluable short history of this specialty, of interest to all, whether specialists or not. There follows a brief description of X-ray and radium physics, and X-ray apparatus, passed upon and approved by such masters as Professors Shearer and Kovacic, and by Dr. Harry Wate.

The histological effect of the ray is illustrated with excellent plate work, carefully analyzed and made understandable to the practitioner.

Several chapters are devoted to the dangers of radiation and should be carefully read by those undertaking this form of treatment. This is particularly well done, is not at all overdrawn, and will serve in large measure to protect many patients from thoughtless and ill-advised irradiation. The stress placed by the author on this phase of the subject is a worthy contribution of incalculable value.

The last half of the book gives in detail the treatment of the various skin lesions, grouped and individually. The dosage given is precise, the directions clear and not to be mistaken. Warnings are liberally sprinkled through these pages that, if followed, will prevent, so far as Dr. MacKee is able, any untoward effects.

In only two particulars does the reviewer wish to criticize a wholly admirable work: (1) The output of unfiltered radiation from different Coolidge tubes is not constant, but varies, sometimes widely. This was brought out by Dr. Coolidge since the book went to press. Errors in dosage may be prevented by following the direction for the development of a constant, given on page 159. (2) At least in the military service, the treatment of acne of the face should not be attempted by X-ray, except most cautiously, in selected cases.

Again, attention is invited to the remarks of Dr. MacKee on the dangers of irradiation therapy. This is not a subject to be entered into lightly, and cannot be learned from this or any other book alone. X-ray and radium therapy can only be safely done by those having experience with it, and this experience, in the military service, can only be gained by assisting a roentgenologist who has been trained in this work.

H. C. PULSIFNEY

## Obituary<sup>1</sup>

### MAJOR JAMES M. BENTLEY

A wide circle of friends will hear with deep regret the news of the death in Baltimore Monday night, December 12, of Dr. James M. Bentley, one of the best known of the younger physicians in Cincinnati. His mother, Mrs. M. H. Bentley, of 3517 Middleton Avenue, Clifton, received a telegram on Saturday morning telling of her son's serious illness, and she and his brother, Mr. Henry Bentley, left at once for Baltimore. On Tuesday a telegram announcing his death was received at the home.

Dr. Bentley's death comes after an illness of many months in a Baltimore hospital, where he went in the hope that rest would restore the nerves that had been under so great a strain during the war, for Dr. Bentley was on the front in France when the news came to him of the death of his brother, Lieut. Robert E. Bentley, in the fighting in the Argonne.

Dr. Bentley was born thirty-four years ago in Ludlow, Ky. His family moved to Cincinnati when he was three years old. He was graduated from Walnut Hills High School, attended the University of Cincinnati, and received the degree of doctor of medicine from the Ohio-Miami Medical College in June, 1911. He then spent eighteen months as an interne and house physician at the Cincinnati general hospital before starting into practice. He specialized in the diseases of children and had achieved success in his chosen line of work. He quit practice in June, 1916, to serve his country as a captain in the First Ohio Field Hospital Corps and was on the Mexican border ten months. He had entered the Ohio National Guard as a private in 1907.

He was honorably discharged from the Army when he returned from the Mexican border, but when in April, 1917, the United States declared war against Germany he again heard the call of his country. He was commissioned to organize the First Ohio Motor Ambulance Company, later the 147th Ambulance Company of the 37th Division, and was then promoted and, as a major, was transferred to the 136th Field Artillery, of which he was the regimental surgeon. With them, under Col. P. Lincoln Mitchell, he served throughout the war. The medical record of the 136th Field Artillery showed no deaths from disease during the entire war, although the "flu" was everywhere prevalent.

In April, 1919, Dr. Bentley returned from overseas with the 37th Division and resumed the practice of medicine. He was on the faculty

of the Medical College of the University of Cincinnati, the College of Pharmacy and upon the staff of the Pediatric Service of the Children's Hospital and of the General Hospital. He had been for many years the Children's Home physician. He was a member of the Academy of Medicine, a fellow of the Ohio State Medical Association, a member of the Central States Pediatric Association, the Association of Military Surgeons, the American Medical Association, besides being on the board of the Robert E. Bentley Post of the American Legion. He belonged to Sigma Chi and Nu Sigma Nu fraternities, the Cuyier Press and the University Club. He was a member of Christ Episcopal Church.

He is survived by his father and mother, Mr. and Mrs. M. H. Bentley; three sisters, Mrs. Clifford M. Stegner and the Misses Julia and Louise Bentley, and a brother, Henry Bentley, attorney.



# THE MILITARY SURGEON

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## THE SURGEON AND THE OPERATOR

### A LESSON IN STRATEGY AND TACTICS<sup>1</sup>

BY ASTLEY P. C. ASHHURST, M.D., PHILADELPHIA

*Colonel, Medical Reserve Corps, U. S. Army*

WHEN your president honored me by an invitation to address you this evening, my first intention was to select some border-line topic in surgery, which might, I hoped, prove of interest to medical men as well as to surgeons. But when I noticed that I was already on your preliminary program for an address on "Surgery," I felt that an opportunity long awaited was at last within my grasp: an opportunity to attempt to express just what one who ventures to call himself a surgeon understands by the title, what are his ideals of surgery, and in what ways he believes the profession of surgery differs from, and is related to, that of medicine.

You know it has been said by some sarcastic physicians that a surgeon works with his hands, while a physician works with his brains. But this is not a true distinction; for the first requisite of a modern surgeon is that he be an educated physician, that he receive precisely the same preliminary training and the same education, while an undergraduate student, as do all other students of medicine. This is true also of much narrower specialists than is the general surgeon—of the ophthalmologist, the aurist, the gynecologist and obstetrician, the urologist and the orthopedist. Even the profession of dentistry is now becoming worthy of its title, since a better preliminary education and a much wider and more thorough training in the medical sciences are required before graduation.

And for all our students who graduate as Doctors of Medicine should come a period of one or two years as hospital interne; and again, during this period, training and experience in the medical wards should precede the term of duty on the surgical service. At the end of this period, moreover, our young physicians have only enough training to become sane, safe, useful, general practitioners. For those who wish to devote

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<sup>1</sup>An address delivered January 23, 1922, at a meeting of the Associated Physicians of Montclair and Vicinity.

themselves to surgery, because of special aptitude or opportunity, must come another prolonged period of training before they can properly be classed as surgeons. Such systematic training formerly was the rare privilege of the few, and was secured by a sort of apprenticeship to some master in surgery. It is always a pleasure to me to acknowledge the debt I owe in this respect to the late G. G. Davis; the practical lessons in surgical diagnosis, pathology, therapeutics and operative technique which I learned from him throughout a period of ten years of closest association have been the basis of whatever success has come to me since. Such training in surgery may now be acquired in graduate schools of medicine, and it is a satisfaction to Philadelphia surgeons to realize that their own Alma Mater now provides the best possible courses of this kind.

It is true in a certain sense of the surgeon, as of the poet, that he is born, not made; but no true surgeon can fail to appreciate the value of systematic training. So it is well that we now have established in this country on a firm foundation the American College of Surgeons, fellowship in which body is intended to indicate that the title of surgeon is worthily born.

But it is on account of our pride as surgeons in our preliminary training that we, who are admitted to the fellowship of the most venerable medical organization in this country, rejoice that it still retains its title of The College of Physicians of Philadelphia and has never adopted the hybrid designation of College of Physicians and Surgeons.

It is important, also, to bear in mind that there are no such separate entities as "surgical anatomy," "surgical physiology," "surgical pathology," or "surgical diagnosis," in the sense too often, I fear, associated with these popular titles—in a sense, I mean, which would draw a distinction between *surgical* and *medical* anatomy, physiology, pathology or diagnosis. It is permissible, perhaps, to use these titles because of their convenient form, but this usage should not lead us to forget that what we really mean is the anatomy, physiology, etc., of those parts of the body or of those diseases in which the surgeon is particularly interested in our day and generation. We must recollect that not so many generations ago anatomy, for instance, was not much more than an abstract science, and dissection a pleasing but not very useful art; until the genius of men with surgical inclinations created the "applied anatomy" of those parts of the body in which they were specially interested—as did Astley Cooper for the anatomy of hernia, dislocations and joint fractures; Colles and later Denonvilliers for the anatomy of the perineum, Farabeuf for the applied anatomy of the limbs, Chiene and Macewen for the brain, Kocher for the thyroid,

Terrier, Mayo Robson, and Mayo for the upper abdomen, and others too numerous to mention for many other parts of the body.

Thus it is evident, I submit, that the surgeon differs from the physician only in that he has acquired by natural inclination and by training, an aptitude, an experience—may I not say a *success*—in the *treatment* of certain affections of the human body which are beyond the scope of medicine pure and simple. And this difference in the treatment is, above all, *mechanical* in nature. If fractures and lacerated wounds, and abscesses and tumors could be treated successfully by means of drugs or vaccines or sera, these lesions would not be classed as surgical affections; and so soon as any other than mechanical forms of treatment shall be found which will give better results in these or in any other diseases now classed as surgical, the surgeon—the true surgeon—will be the first to welcome these remedies and to refer to the physician all patients with such affections.

But I would not have it thought that mechanical methods of treatment alone are permissible in surgery; for, as John Hunter said, "Surgery consists in curing a disease rather than in the removal of it by mechanical means." So it is incumbent on surgeons not to neglect their duties as good physicians in the care of their patients; let them never forget they are physicians as well as surgeons, and that they are the latter only incidentally. Astley Cooper declared he would resign his position the next day as surgeon to Guy's Hospital if he thought any objection should ever be raised to his prescribing for his patients such drugs and such diet as he thought proper, as if the latter functions should devolve solely on the physicians to the hospital! But at the same time the modern surgeon does not claim to be so self-sufficient that he is unwilling to seek the aid of his brother physicians in consultation when more medical skill seems to be required than he feels himself to possess. Similarly, he makes no objection to the physician performing such minor surgical operations as lumbar puncture, tapping the abdomen for ascitic fluid, introduction of gases into the pleural cavity to produce a therapeutic pneumothorax, and the like mechanical procedures; knowing that the conscientious physician will not overstep the margin of safety by attempting operations for which his training and experience have not fitted him. Let me say also that there are true surgeons who feel a Hallerian diffidence in attempting certain rare and difficult operations when colleagues are available who can and habitually do perform such operations with an absolutely unapproachable standard of success.

I have been speaking so far only of methods of treatment, but the surgeon looks upon diagnosis also with a mechanical mind: he measures the length and circumference of limbs, he records by his goniometer

the angle at which a joint is contracted, and he looks through the fluoroscope or at the skiagraphic plate to see calculi, tumors, angulations of intestine, etc., which may be productive of mechanical obstruction. He tests for anesthesia, and for lost function in individual muscles, with the idea of locating a mechanical obstruction in a nerve trunk; he tests the pressure of the intraspinal fluid and examines the eyegrounds for evidences of mechanical obstruction or of pressure in the intracranial cavity. He studies the duodenal contents to discover a blockage of the pancreatic or the common bile duct.

The fact certainly bears emphasis that the best and truest surgery is that which is most mechanical in nature. All surgical affections, in the last analysis, may be classed either as injuries or deformities, for it is against such lesions that medicine alone is powerless. No one is so senseless as to hope to cure hare-lip or cleft-palate by administration of drugs; nor so optimistic as to expect a bleeding vessel to heal unless the bleeding is mechanically arrested. Are not tumors veritable deformities, whether in the breast, the brain, the stomach, or the prostate? Are not strictures deformities, whether in the esophagus, the rectum, or the urethra? Gallstones themselves are a deformity, and so, I opine, is the vermiform appendix.

And if the surgeon goes far astray from mechanical forms of treatment, he will sooner or later find himself treading on thin ice, with great danger of plunging into some air-hole and drowning his reputation in the cold waters of Lethe. Look at the abuse to which the operation of gastrojejunostomy has often been subjected; so long as it is confined to the relief of pyloric obstruction it is a rational mechanical procedure, but when it is employed in the hope of curing vague upper abdominal symptoms for which no cause can be found, it is a failure. Ulcers of the stomach or duodenum, being deformities which in many cases cannot be cured by medicine alone, come legitimately under the care of the surgeon and are best treated surgically by excision. That certain ulcers of the duodenum, which cannot safely be excised, will cease to give symptoms (and have been proved to heal) after a properly performed gastrojejunostomy, is a fact developed by *Art*, which *Science* so far has failed to explain. But when once any such fact has been established, it is the part of wisdom (and surgeons should be wise) not to attempt to dispute the fact but to wait patiently until science has explained it. *Art* is the forerunner, the pioneer, the prophet; she establishes facts by observation, by experiment, by experience. *Science* is her servant, not her master; it is her duty to follow where *Art* leads the way, and to endeavor to explain the facts already established by *Art*. There is too much idle speculation at the present day masquerading under the name



of science; too much aimless animal experimentation being employed without any clear idea of the problem to be solved. When John Hunter said to the idle theorist, "Don't think; try!" he did not mean to discourage the use of the mind in intellectual processes; but he meant "do not *suppose*, or *believe* a thing is thus and so, but make the experiment and find out!" It was because Hunter practised what he preached, because when he thought of a thing he did it, that he is recognized by subsequent generations as a genius; and it is in this sense that we must understand his historic phrase "Don't think; try! Be patient; be accurate."

So we see that no true scientist, whether medical man or surgeon, has any right to rest satisfied with mere belief when knowledge is within his reach. We have no right to suppose or believe a patient has fever if there is a clinical thermometer available by which the fact can be proved; no right to think a patient has lost weight if scales are at hand to weigh him and so change our supposition into certainty; no right to hope a patient's kidneys are acting properly if we have access to a laboratory which will ascertain the fact. We have the right of *belief* in those things only which are insusceptible of proof. For how many centuries did men *believe* that the arteries carried air (because always found empty after death), and that only the veins pulsated and carried blood, until the genius of Harvey enabled him to demonstrate the circulation of the blood away from the heart through the arteries, toward it through the veins! Others before him may have had the *belief* that this was what occurred, but it remained for him to act upon his belief. He didn't only *think*; he *tried*.

And now let me come to the subject of operative surgery, and try to explain to you how the surgeon differs from the mere operator. An operation is, in truth, the highest function of surgery, for though very many surgical diseases may be cured without resort to the scalpel, yet operative surgery is the apotheosis of the mechanical application of our knowledge of anatomy and pathology to the treatment of disease. You might think, therefore, that operative surgery would come by nature to anyone thoroughly educated in these fundamental studies, and it may be a surprising thought that there are such things as principles of operative surgery of which neither anatomist nor pathologist has the faintest conception. Indeed, were the knowledge of a Leidy and a Virchow combined in one individual, I should much less willingly submit my body for operation by such an one than by one of our recent graduates who had just completed his internship in a first-class surgical service.

If I were to give any subtitle to this part of my address, I should call it "A Lesson in Strategy and Tactics," because in no other way than by

considering operative surgery under these two aspects can its true significance be appreciated. And if what I shall have to say seems but an echo of that wonderful book by Marshal Foch on "The Principles of War," I must plead as my excuse that study of this volume will inspire any surgeon with a new understanding and appreciation of the time-honored expression, "warfare with disease"; for he will there learn in how very many respects the strategy and tactics of operative surgery resemble those of actual warfare—with the sad difference that it is the surgeon's fate to wage war with an enemy to whom the final victory is always accredited, no matter with what ability he is fought or how long his victory is postponed by the surgeon's skill: that implacable enemy is death.

In military parlance strategy differs from tactics in that the former has to do with the assembling and placing the armies on the field of battle, whereas the latter is concerned with their use only after the battle has begun. Similarly, in operative surgery, all that leads up to and prepares for the actual operation has to do with strategy; only the actual manipulations are to be regarded as tactics. Strategy is the brain of the surgeon; tactics is his hand.

Formerly, the physician was the strategist, while the surgeon (and he a vile barber-surgeon at that) was a mere tactician, doing what was planned and directed by his master, the strategist. Now it is incumbent on the surgeon to maintain for his patient's good, even more than for his own reputation, his standing as a strategist won through several centuries of arduous endeavor; he should keep to the mountain peaks which he has scaled at last, and should beware of those Avernian fields into which the descent is so easy but from which the return is so very laborious. Is it not worthy of note that the greatest surgeons of our own day, as indeed those of all past time, have been noted as strategists and not as mere tacticians? The names of those who have invented a new instrument or a new way of operating, a new antiseptic, or a new splint, may be, and frequently are, more often on the lips of their contemporaries, and their names may even be transmitted to posterity along with their inventions. But the greatest surgeons of today, and the old and loved masters of the past, are known to us not from some petty piece of apparatus, but from their teaching of the science and art of surgery; being in no whit deficient in tactics, they excelled as strategists. What instrument or way of operating is associated with the name of Pott, of Cooper, of Gibson, Velpeau, Gross, Paget, Ollier, Lucas-Championnière, or of my own honored father? Nélaton's lucid teaching did more to assuage the ills of humanity than did his probe or his catheter. Lister is remembered not for carbolic acid but for the principle of

antisepsis in operative surgery. Terrier is remembered less for his brilliant technique and skillful tactics within the abdomen than because, by the adoption of the principle of asepsis, he made the abdominal cavity accessible. Dupuytren's name evokes memories of his study of joint fractures rather than of his splint; Volkmann connotes not a curette but a master of bone surgery; Billroth, not a method of gastrectomy but a surgical pathologist, and Murphy's name will be honored as a teacher when the button is forgotten.

Many persons have an idea that the only way to learn war is by fighting or to learn operative surgery is by doing operations, and they regard any didactic instruction as quite superfluous. These are they who would make of the operator a mere tactician, and who yet forget that even the actual manipulations of an operation must follow a certain order, and that this sequence is much better learned in advance of the operation by taking forethought rather than during its progress by making mistakes which must be retrieved. So it is that you will find one surgeon, who has been properly trained, doing his first operation of a certain kind (very likely a complicated and difficult procedure) without hesitation, going from one step to the next without detours or unexpected collisions, with such perfect *sangfroid* that the uninformed witness might think the operation one of everyday occurrence; while you will see another surgeon doing a comparatively simple operation, perhaps for the tenth or the fiftieth time, with innumerable blunders and mistakes as if he understood nothing of its nature. Thus Foch points out, writing of the battle of Nachod (1866)—one of the engagements which immediately preceded Sadowa—there was on the one side the 37th Prussian Regiment: "That regiment has not fired a shot since 1815; it took no part in the minor Schleswig-Holstein conflict of 1864. It is the instruction of fifty years of peace which we shall see applied against the Austrian army which has fought recently (in 1859). We shall soon recognize, on one side men who know war without having waged it, the Prussians; on the other side, men who do not understand it though they have made it."

It is, therefore, before the surgeon becomes an operator, that he must learn tactics; but even before he learns his tactics he must be a strategist. The surgeon, himself, is the commander-in-chief; it is he alone who can indulge in strategy; all others—assistants, anesthetists, nurses, orderlies—merely execute tactics. It is he, as the Marshal says, who conducts the orchestra; the others merely play their parts. And the battles are lost or won by the generals (strategy), not by the troops.

One of the first principles of operative surgery, as of war, is *obedience*:

active obedience, full of initiative, not mere passive, dull, laggard acquiescence in the plans of the commander-in-chief. Each assistant in an operation, having his or her task clearly assigned, must exert active intelligence and initiative in the fulfilment of that task. Few, if any, operations of consequence can be carried to a successful completion without the help of one or more assistants. Good assistants are those who exhibit this initiative; indifferent assistants are they who constantly have to be jacked up to their task; and bad assistants are those who are not merely passively indolent but may be actively in opposition to the strategy and tactics of the surgeon in command. Hence the subordinates must have confidence in their chief, they must actively sympathize with his plans, and his character must be such as to conciliate their most enthusiastic cooperation. Happy is the assistant who can choose his own chief! An assistant who regards his chief as an inefficient surgeon, who mistrusts his strategy and fears his tactics, cannot be a good assistant. Was it not such feelings as these that made Longstreet an inefficient general at the Battle of Gettysburg? Was there not some feeling of wounded *amour propre* in his indifferent execution of the tasks assigned by his commander-in-chief, after the latter had rejected the plan of battle proposed by his possibly more experienced subordinate? Longstreet was not "disciplined" in the military sense, as shown by the fact that he gave way to his feelings of insubordination.

In surgery, as in war, there are those who rely too much on strategy, forgetting that only tactics, only the actual engagement with the enemy, only the operation itself, can give a decisive result. They delay operation, on one pretext or another, in the case of lesions which can be cured by operative means alone. They procrastinate with the most fatuous ineptitude, in the face of every reason which should urge them on to immediate operation. They resemble the Marshal of Saxe who said, "I do not favor battles, especially at the beginning of a war. I am sure that a clever general can wage it as long as he lives, without being compelled to battle." Thus it is that surgeons of this type, who are no operators, and who fear to expose their own tactical inefficiency, will take care of a patient until he dies from a disease for which no cure but operation is known.

Now strategy consists in planning the operation; this involves not only determining what the operation shall be—for instance, whether an excision or an amputation—but also in deciding upon the steps of the operation. Strategy implies, first of all, *diagnosis*; it must include no less the *prognosis*; and finally, has to determine upon the *treatment*. No amount of excellence in tactics can repair a fault of strategy. An

operator, in the case of a lacerated wound of the forearm, may suture the proximal end of the divided median nerve to the distal end of the flexor longus pollicis: I have known it to be done; the union was perfect because the tactical part of the operation had been done with the greatest skill; but because of the strategical blunder the patient recovered no function in the distribution of the median nerve. The most lamentable blunders and shameful errors always are due to defects of strategy; and if an operation, for any reason, proves unsuccessful, the conscientious surgeon always feels more chagrined when the fault is due to bad strategy than if the result merely of a tactical blunder or accident.

The story is well known of a brilliant Irish surgeon, Dease, who, in making rounds one day in his wards, came upon a patient with a red, painful, hot and tender swelling in the groin. Dease, thinking it was an abscess, inconsiderately thrust his bistoury into it, expecting to relieve his patient by giving exit to the pent-up pus. An overwhelming gush of blood followed the incision, and though Dease immediately recognized his error and tied the femoral artery, an inflamed aneurysm of which had been opened, the patient promptly succumbed. Most of us (for who has not committed some gross fault of strategy?) can imagine what were the feelings of this brave surgeon as he grimly continued his rounds that morning, visiting with meticulous care all the other patients in his wards; and can even follow him home, where with despairing hand he bared his own thigh, plunged his bistoury into his own femoral artery, and bled to death in retribution for his professional sin.

This was an error of strategy; it is an example of strategic surprise. Strategic safety is to be secured only by ascertaining all the facts before the battle is joined. It is not safe to depend on surmises. But if, during a well-planned operation, executed with proper care, for the extirpation of an adherent malignant growth, a large vessel is damaged, with resulting hemorrhage from the effects of which the patient subsequently dies, the surgeon will under such circumstances have much less reason to reproach himself than had Dease in the historical instance just cited: the error is one of tactics, not of strategy.

In selecting the operation one must *suit it to the patient*, for the operation must be finished before the patient dies. A surgeon must not attempt to resect the esophagus for carcinoma when his patient's starvation demands immediate relief by gastrostomy under local anesthesia. So we see that there are two kinds of operations to be considered—complete operations, which are comparable to battles for victory; and incomplete operations, which resemble battles for defense and which are always indecisive. For instance, in a case of diffuse

peritonitis following a neglected attack of appendicitis, when the patient has been brought safely through the attack until an abscess has formed, it very rarely is justifiable to do more than open the abscess—an incomplete operation, indecisive in curing the disease, though it will tide the patient over the present acute attack. But the surgeon must bide his time for final defeat of the enemy (by appendectomy) until his patient is able to endure the more serious operation.

Another important principle of strategy is *not to wage two wars at one time*; concentrate all your forces on the strongest point of the enemy's lines, defeat him there, and the weaker parts will surrender as a natural consequence. Let me narrate a strategical blunder of my own in this connection: I was operating one night at the front, in an evacuation hospital, on a soldier with a badly mangled foot; he had also an insignificant looking wound in the thigh on the same side. I began the operation by attempting to repair the damage to the foot and found such constant venous hemorrhage from all the wounds that it proved a tedious job to arrest it. Meanwhile the patient's condition was becoming worse, without apparent cause, so far as I could see. Having at length completed the disinfection of the foot to my satisfaction, but with what I realized was inordinate delay, I turned my attention to the thigh wound and promptly found there the cause for my venous bleeding below as well as for the patient's alarming general condition: he had a shell wound involving the femoral vein, and the return flow of blood from the foot being interrupted, he had been bleeding to death from the open wounds in the foot. I should have attacked the main lesion first and might thereby have saved the patient's life.

This principle I have just mentioned involves also that known as the *economy of forces*; the knowledge of how to use one's available resources to the best advantage; to be neither extravagant when such expenditures are useless, nor timid and niggardly when every available resource, including every man of the *reserves*, will be required to defeat the enemy. Thus I have heard of a surgeon who, through excessive caution, when he was about to do a partial amputation of the foot, employed for temporary hemostasis not only an Esmarch band around the thigh and a screw tourniquet just proximal to the elastic constrictor, but who also assigned one assistant to compress the femoral artery in the groin. I have seen also, laid out for comparatively simple operations, as many as fourteen pairs of retractors of various sizes and shapes, when any ordinary surgeon could have dispensed with any retractors; and at the end of a not very complicated operation I have counted eighty-five separate individual instruments carefully prepared for participation in the battle, not one of which had been used. A good

strategist does not send an army corps to defeat a regiment nor an entire regiment to capture a squad of marauders.

On the other hand, it is above all things important to be prepared, willing and able, to spend every last drop of blood of the attacking forces, if it be necessary in order to defeat the enemy. Do not begin a large operation with only a scalpel and three hemostats. And do not keep your reserves so far in the rear that they will first learn of the defeat of your army from the retreating troops. Do not have your donor for blood transfusion arrive only as your patient's corpse is wheeled out of the operating-room door. By the same token, keep your instruments in such order and so accessible that they may be found when you want them. The surgeon who is always sending out for other instruments is a bad strategist, or is badly served by his assistants.

*Strategic Safety*, to which I have already referred, concerns the surgeon at other times also than during encounters with the enemy. He must finish his operations in such a way that neither he nor his assistants will be unduly disturbed while they are on the march or are encamped at night. If a surgeon's patients must constantly be returned to the operating room at odd hours, for him to revise the wound, to replace prolapsed intestines, to check consecutive or secondary hemorrhage, he will have no opportunity to perform the operations which are required on other patients, and no time for regular ward rounds; the system of his service will suffer, and the patients who do not require operative treatment will be neglected. There are enough emergencies arising, not of the surgeon's making, to disturb his internes and his assistants, if not the surgeon himself, during the hours which should be devoted to sleep; and he should blame himself when post-operative accidents develop which a better strategist or tactician could have prevented.

Then the surgeon must maintain his *freedom of action*; the patient's disease must not be allowed (while under the surgeon's care) to gain such headway that only a mutilating or crippling operation will cure. An osteomyelitis, if recognized in time, or a benign tumor of the breast, may be cured by a comparatively simple operation; if neglected, death may result in spite of all that surgery can do. *Principiis obsta*—resist the beginnings of disease—is the surgeon's motto, because it is for his patients' welfare, not because early operation is easier for the surgeon.

So much has been said in praise of strategy that it may be thought I am inclined to minimize the value of tactics, but nothing could be further from the truth. I have already said that strategy alone is of no value: only when supplemented by tactics has it any reason for existence. The war without battles, which I mentioned a few moments

ago, has no place in modern surgery unless any operation, howsoever simple and certain in its results, will not only fail to avert imminent death but will surely hasten it. Only under such circumstances, I repeat, can a surgeon hope to resemble Henry, brother of Frederick the Great, of whom Massenbach wrote: "He knew how to woo fortune by bold moves; more fortunate than Caesar at Dyrrachium, more great than Condé at Rocroi, he attained, like the immortal Berwick, *victory without battle*" (Foch).

And yet strategy is strangely limited by tactics. It is true, of course, that tactical advances are always being made, and that very many operations are now frequently done with success which one or two decades ago were of very doubtful expediency; and there is reason to believe that improvements in tactics will always continue, so long as the strategist continues to seek the solution of his problems. The following may be cited as an illustration of the limits which tactics impose. A colleague told me that the late Weir Mitchell, who, as you well know, was not a surgeon, seriously proposed to him the resection of the spinal column in the case of a patient whom he saw no chance to relieve by medical measures alone. "You will go in," Dr. Mitchell explained, "push the aorta and vena cava away from the front, loosen up the attachments of the diaphragm, saw the bodies of the vertebrae through above and below the seat of the disease, split the segment to be removed so as to extract the spinal cord, and allow the healthy vertebrae above and below the lesion to settle down into contact." Had this strategist possessed any knowledge of tactics, he would have realized that, in the present state of surgical tactics at least, such an operation would have resulted in the death of the patient on the table. Yet who shall say that some time in the future such an operation may not succeed?

Then there is another way in which tactical questions impose a severe limitation on strategy. It often happens that a surgeon is called as consultant by a rather inexperienced colleague who himself wishes to operate on the patient whose case is under discussion, and desires the more experienced surgeon only to tell him what to do; the junior recognizes his own strategical ignorance but not his tactical incompetence. The consultant, if he is incautious, will find himself advising an operation which in the hands of the intended operator is nearly certain to prove a failure, even if the patient should survive the experiment. The conscientious consultant may be hard beset under the circumstances to make his less experienced colleague appreciate the dangers which the patient may run, without offending both his colleague, the patient, and the latter's family, and without making it



seem that he is unduly conceited as to his own ability in the premises.

This is not the place to speak at any length upon the actual conduct of the operation. Let me say, however, that no operation, except in very rare circumstances, should be undertaken as a mere exploration; that every operation, in other words, should have a distinct objective in view (which requires a pre-operative diagnosis), and that, moreover, every operation should, so far as possible, be reduced to a type. Individual variations in tactics there must always be, but no operation can be regarded with favor which is undertaken in haphazard fashion, with no well-defined plan of action determined in advance. In every operation, even the simplest, *the steps should follow one another in fixed order*; do not try to reduce a strangulated coil of intestine before you have divided the constriction, tie off your main vessels in an amputation before releasing the tourniquet, and release the tourniquet before you suture the stump. Do not hurry your operations. "*Festina lente.*" Remember always that it is better to be safe than brilliant. Preserve your *freedom of action*: (1) by large incisions in all difficult cases (the "*chirurgie à ciel ouvert*" of which Poncet wrote has much to commend it); (2) by efficient use of the advance guard, whether an Esmarch band for temporary hemostasis or gauze packs isolating an infectious focus in the abdomen; and (3) by means of the flank guards (as, for example, hemostats on collateral vessels before they are cut) keep open the advance of the main attack. Remember that *multiple attacks are disastrous*; in excising tumors, get control of the main blood supply as early in the operation as possible; and recollect that *an attack once begun is almost always less costly if carried through to completion* than if abandoned, for great destruction overtakes retreating troops from the counter attack. Finally, recollect that in cases of hemorrhage even when all appears lost, a direct frontal attack may sometimes block the enemy as he debouches from a narrow pass; if you can't do anything else, keep your finger on the bleeding vessel until help arrives.

You will understand from what I have said that I have a very high ideal of surgery and of the surgeon. It is a profession which demands the noblest traits of character, the highest self-denial, the utmost patience and persevering industry. It demands not only the greatest manual skill and dexterity, but it demands the very highest intellectual attainments; there can be no skill nor any intellect too high for the profession of surgery. Those of us who teach and practice surgery are aware, much oftener, I am sure, than our colleagues or our patients realize, of our own shortcomings and our uncertainties of judgment. Vidal de Cassis truly said, "*Les moyens chirurgicaux sont directs et quelquefois terribles.*" To no one except the surgeon is committed

such absolute power over human life; and such sublime confidence in his trustworthiness is felt by his patients that he must always regard his task as a sacred charge; he cannot avoid the feeling that there is in truth a religion in surgery. He knows well the truth of that saying of Ambrose Paré: "I dressed the wound, but God healed it." It has happened to every surgeon to watch at the bedside of a dying patient and to ask himself whether what has been done was all that could have been done under the circumstances.

So long as he is conscientious in his deeds and thoughts, so long as he does what he believes to be best at the time, sparing no effort in the battle (which, as I have said, is always a lost battle at the end), just so long will the surgeon have no real cause for self-reproach and will continue to deserve the confidence of his patients and of his colleagues. And when his own final hour shall come, whether he be cut off in the prime of life or shall have reached a venerable old age, whether he be known alone to his immediate patients and friends or whether he be mourned by the profession throughout the nation or the world, the cry of those who watch at his bier alike shall be: "Let me die the death of the righteous, and let my last end be like his!"

# A STATISTICAL STUDY OF THE PREVALENCE OF SYPHILIS IN THE CHINA EXPEDITION, 15TH U. S. INFANTRY

BY CAPTAIN RAE E. HOUKE  
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(With five illustrations)

AMONG the United States troops of the China Expedition venereal disease offers for solution a problem of ever-increasing gravity. The China Expeditionary Force of the United States is formed by the 15th U. S. Infantry with attached troops, having a total strength at the time of writing of 1,158 enlisted men. With the exception of two companies, which are located at Tongshan, China, the entire regiment is housed within the limits of a compound located in the ex-German concession of Tientsin, China. This compound covers only about the area of a small city block, and located within its limits are barracks, storehouses, headquarters buildings, a recreation hall, power plant, hospital parade ground, etc. This area is under United States military control.

Tientsin is the great seaport and commercial center of North China, having a population of over a million, mostly Chinese. The foreign population is comparatively small, numbering only about 12,000. Almost every race is represented, the Japanese, Russians, and British predominating in the order named. The foreigners reside largely within the various concessions, which are governed by the laws of the country to which allotted. Tientsin has been open to western trade since 1860 and has absorbed almost as many of the vices as it has of the virtues of western civilization.

In a very excellent article which was recently published in THE MILITARY SURGEON by Capt. I. A. Pelzman, M.C., U. S. Army, chief of the genito-urinary service of the China Expedition, the problem presented by venereal disease as well as an explanation of the high venereal rate present were most ably discussed, and it is not within the scope of this article to attempt to dilate upon them. A table presented in that article, comparing certain data pertaining to the Army within the United States with that for the forces in China, will be presented. The data included in this table were collected by means of cards which were distributed to the men, preceded by a talk in which it was fully explained that the information requested was solely for the purposes of collecting data and that any man was free to refuse to answer any or all of the questions. If answered, however, truthful replies were essential. The cards were then filled out and handed in unsigned.

There were 1,061 answers received, and of this number 920 men admitted illicit intercourse over a period of six months, with a total of 15,207 sexual contacts. There were 246 admitted cases of venereal infection over the same period of time.

TABLE OF COMPARISON BETWEEN THE U. S. FORCES AT HOME AND IN CHINA<sup>1</sup>

	<i>United States, one year</i>	<i>China, six months</i>
Chastity.	34%	11%
Exposures per man . . . . .	28	16.8 (32.6)
Venereal infections. . . . .	7.4%	26.4%
Infections following prophylaxis . . . . .	1-220	1-62
Infections with no prophylaxis . . . . .	1-305	1-59

From the above table it will be noted that while the average number of exposures per man in the China Expedition is but slightly greater than in the United States, the rate of infection for six months is more than three times as great as at present in the United States for the entire year. Therefore we must cast about for the elusive Ethiopian who is concealed within the Chinese woodpile.

Discussion of a subject of this nature is always more or less unpleasant, since it brings into the foreground the baser, animal side of humanity. Houses of prostitution are plentifully located within the native or Chinese city as well as within the various foreign concessions of the city. None of these houses are operated for the exclusive use of the soldier, nor has the commanding officer of the China Expedition any jurisdiction over them. He may prohibit his soldiers from entering a certain district, but as there is lack of cooperation on the part of the native authorities the women in such areas move into non-restricted ones. While it is hardly fair to say, without absolute proof, that 100 per cent of the inmates of these districts are infected with some form of venereal disease, yet such is very nearly the case. In summarizing it may be said that the high venereal rate existing in the China Expeditionary Forces is due largely to the high rate of exchange plus the low cost of sexual contact.

It is the intention of the writer to consider only one phase of the venereal disease problem of the China Expeditionary Forces, i. e., syphilis and its prevalence. In January, 1921, there were 156 soldiers carried on the syphilitic register, amounting to 13.4 per cent of the entire strength of the expedition. In order to be certain that these figures represented all of the syphilitics present permission was obtained from the commanding officer to do a routine complement fixation test upon the blood of the entire enlisted force of the regiment.

<sup>1</sup>Capt. L. A. Polzman, M. C.

TABLE 1.—AVERAGE STRENGTH, AGE, AND LENGTH OF SERVICE

CHINA EXPEDITION, FIFTEENTH U. S. INFANTRY

<i>Company</i>	<i>Strength</i>	<i>Average age service years</i>	<i>Average total service, years</i>	<i>Average service, years</i>
"A".....	64	26.0	4.0	1.3
"B".....	63	25.5	3.0	1.4
"C".....	69	26.2	4.0	1.5
"D".....	58	25.6	3.1	1.7
"E".....	76	24.5	3.6	1.8
"F".....	78	24.5	3.3	1.8
"G".....	79	24.5	3.5	1.7
"H".....	65	24.6	3.6	1.6
"I".....	79	25.5	3.6	1.2
"K".....	82	26.8	3.5	1.6
"L".....	77	25.4	3.2	1.5
"M".....	63	23.7	4.0	1.8
Regtl. Hdq.....	33	27.2	5.1	1.8
Hdq., 1st Btn.....	26	25.3	4.7	1.4
Hdq., 2d Btn.....	20	22.4	3.3	1.4
Hdq., 3d Btn.....	24	25.5	3.6	1.6
Q. M. C. detachment.....	36	29.0	5.5	1.8
Howitzer.....	44	25.4	3.7	1.8
Service.....	68	31.0	6.6	1.9
Medical detachment.....	48	27.5	4.2	1.0
Signal detachment.....	6	27.3	6.6	1.5

At this time the China Expeditionary Force, exclusive of commissioned officers, is composed of 1,158 none commissioned officers and enlisted men, grouped into the various organizations shown in Table 1. As our laboratory was not equipped to handle a large number of tests at one time, the various organizations were so grouped that a maximum of 150 would be made at one time. Tests were made three days weekly.

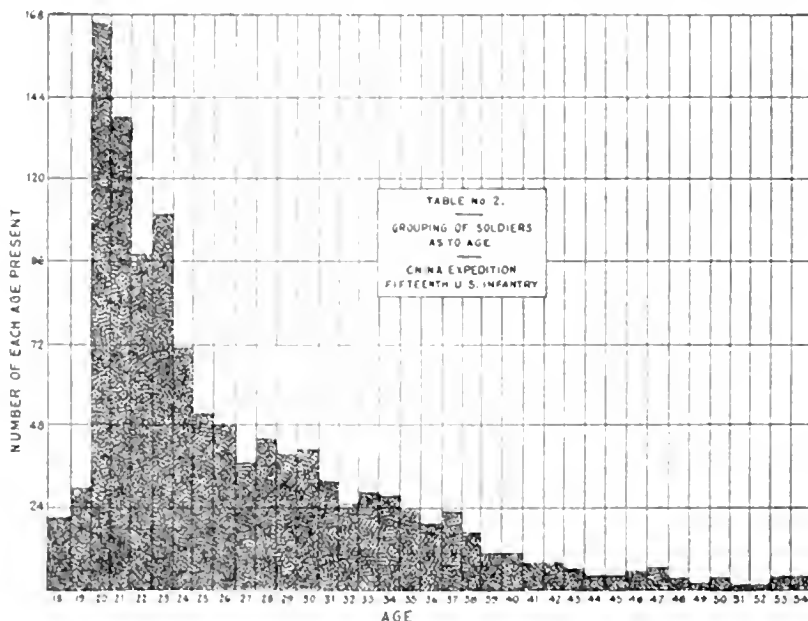
When an organization was reported at the laboratory the commanding officer presented a roster of his men showing, in addition to names, the following data: Age, birthplace, total length of service, length of service in the China Expedition. This information was entered on cards, which also contained space for recording the results of the complement fixation tests. The results of all previous complement fixation tests also were recorded. These cards will provide a complete syphilitic record of the command, which can be kept complete by doing a complement fixation test on the blood of all recruits as they join the expedition.

The routine complement fixation test was used, employing inactivated patient's serum, guinea-pig complement and antigen consisting of alcoholic extract of human heart fortified with cholesterolin. The anti-

human hemolytic system was used and an anti-human cell amboceptor prepared in rabbits.

The tests were read immediately upon removal from the bath and then placed in the ice-box for incubation overnight. The two readings were compared, but the later reading was accepted as the one for record. In tests where there was a great disparity between the two readings both were discarded and a new test made. All tests were read by the writer and all procedures either done personally or under his direct supervision.

As soon as tests were read the results were at once entered on the

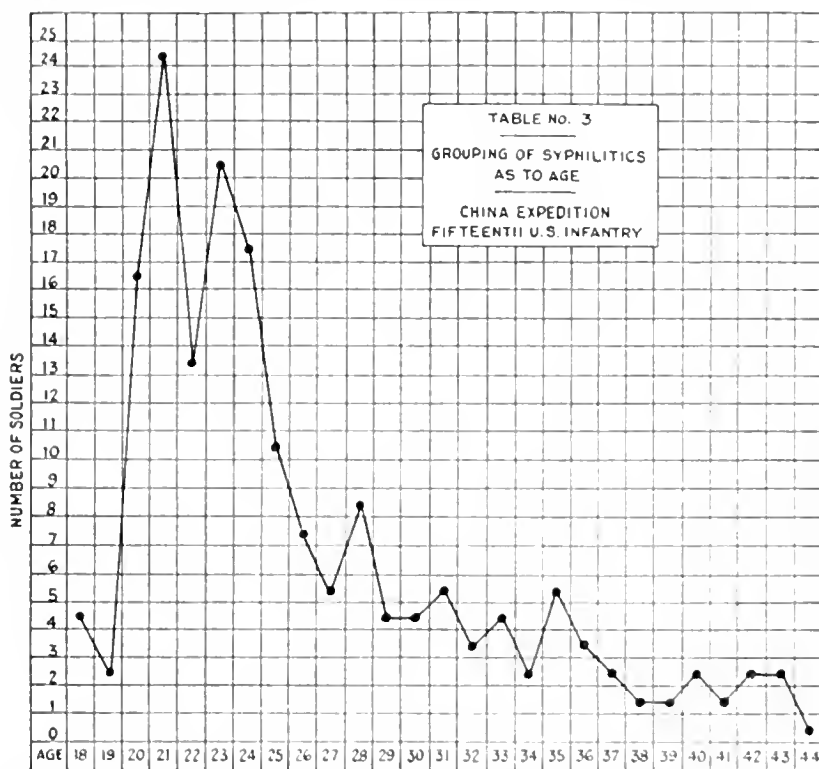


soldier's individual card. All tests which were negative were recorded and the card placed in the permanent file. All cards showing double plus, single plus, or plus minus tests were placed in the active file for further tests, unless the soldier was already on the syphilitic register in which case his card was filed in the permanent file and no additional tests were made except upon request of the genito-urinary service. On completion of the tests the blood of the soldier which had been recorded as positive or suspicious was again considered. The soldier was called up, his history carefully inquired into, and specimen taken for additional complement fixation test. These tests were repeated until either three consecutive negative or a positive result was obtained.

As the result of this examination totaling 1,284 tests, done on the

blood of 1,158 men, eleven new syphilitics were discovered, making the total for the China Expeditionary Force 167, or 14.5 per cent of the entire strength. This may be presented in another light, i.e., that already due to the activity of the genito-urinary service, 98.9 per cent of the syphilitics of the China Expeditionary Force were being given appropriate anti-syphilitic treatment.

Of the eleven new cases discovered six gave a history of venereal sore and secondary rash prior to enlistment. In one case the mental



symptoms, coupled with the physical findings, were alone sufficient to establish a diagnosis, yet in this case a history of syphilis was denied. In the remaining four cases all history was denied and nothing was demonstrated clinically with the exception of a continued double plus complement fixation reaction.

Having completed this phase of the work the writer endeavored, by a study of the data on hand, to isolate any factor which would account for the high venereal rate present in the expedition. The Expeditionary Force was first considered as a whole, and then subdivided into two classes, i.e., the syphilitics and the non-syphilitics.

TABLE 4. PERCENTAGE SYPHILITIC OF EACH AGE REPRESENTED

CHINA EXPEDITION, FIFTEENTH U. S. INFANTRY

Age	Number of men	Syphilitics	Per cent of each age syphilitic	Age	Number of men	Syphilitics	Per cent of each age syphilitic
18	22	4	18.0	37	23	2	8.3
19	30	2	6.6	38	16	1	6.6
20	164	16	9.8	39	10	1	10.0
21	138	24	17.3	40	40	2	20.0
22	98	43	43.2	41	8	1	12.5
23	110	20	18.1	42	8	2	25.0
24	74	17	23.0	43	7	2	28.5
25	50	10	20.0	44	4	0	00.0
26	49	7	14.2	45	4	0	00.0
27	37	5	13.5	46	5	0	00.0
28	43	8	18.6	47	6	0	00.0
29	39	4	10.2	48	3	0	00.0
30	40	4	10.0	49	2	0	00.0
31	32	5	15.6	50	3	0	00.0
32	26	3	12.0	51	1	0	00.0
33	28	4	14.2	52	1	0	00.0
34	27	2	7.4	53	2	0	00.0
35	22	5	22.7	55	2	0	00.0
36	18	3	16.6				

TABLE 5.—PERCENTAGE OF SYPHILITICS IN EACH ORGANIZATION

CHINA EXPEDITION, FIFTEENTH U. S. INFANTRY

Organization	Strength	Average age	No. of syphilitics	Average age, syphilitics	Percentage organization syphilitic
Regt. Hdq.	33	27.2	7	27.1	21.2
Hdq. 1st Btn.	26	25.3	3	27.0	11.5
Hdq. 2d Btn.	20	22.4	1	21.0	5.0
Hdq. 3d Btn.	24	25.5	7	26.4	29.1
"A"	64	26.0	11	25.1	17.1
"B"	63	25.5	5	23.2	7.9
"C"	60	26.2	13	22.8	18.8
"D"	58	25.6	15	25.0	25.9
"E"	76	24.5	6	22.3	7.9
"F"	78	25.5	7	23.8	20.2
"G"	79	24.5	16	26.3	8.9
"H"	65	24.6	7	20.0	10.7
"I"	79	25.5	12	25.7	15.2
"K"	82	26.8	11	26.2	13.4
"L"	77	25.4	11	26.2	14.3
"M"	63	23.3	16	24.5	25.4
Howitzer Service	44	25.4	4	22.5	9.0
Q. M. C. detachment	68	31.0	7	30.0	10.3
Medical detachment.	36	29.0	3	33.0	8.3
Sig. Corps detachment.	48	27.5	4	29.5	8.3
	6	27.5	4	33.0	16.5



The figures shown in Table 1 were summarized, and a table was prepared comparing these figures with those of the syphilitic group.

<i>Class, regiment</i>	<i>Average age</i>	<i>Average total service</i>	<i>Average China service</i>
Complete.....	25.7	3.9	1.5
Syphilitics.....	26.3	3.7	1.2

The results obtained by this comparison were not those expected, since the average age of the syphilitic group was higher than that of the regiment taken as a whole. This is explained by the fact that there were several syphilitics over thirty-five years of age, which raised the average of the group.

The age distribution of the soldiers in the China Expedition is shown in Table 2. Table 3 shows the age distribution of the syphilitics.

The age of the soldiers was found to range from 18 to 54 years, the peak being reached at the age of 20. In the case of the syphilitic group the peak occurred at the age of 23. The majority of cases of syphilis found in soldiers over 30 years of age were of long standing. Over 50 per cent of the syphilis was found in the age group 20 to 25. In Table 4 is shown the percentage of syphilitics in each age group in the expeditionary force. Table 5 shows the various organizations, the average age of the personnel in each organization, the number of syphilitics, their average age, and the percentage of each command found to be syphilitic.

In the China Expedition 16.66 per cent of the soldiers were found to be foreign born. The question arose as to what relationship, if any, existed between the nationality of the soldier and the prevalence of syphilis. A number of analyses were made, but they failed to throw any light on the subject.

The distribution of the syphilitics according to state or country, with minor exceptions, agreed with a corresponding grouping of the entire force.

TABLE 6.—COMPARISON AMERICAN AND FOREIGN-BORN  
SYPHILITICS

CHINA EXPEDITION, FIFTEENTH U. S. INFANTRY

Class	No. of soldiers	Per cent of regiment	Syphilitics	Per cent regiment's syphilitics	Per cent each class syphilitic
American born.	965	83.4	140	12.1	14.5
Foreign born. . . .	193	16.6	27	2.3	12.9

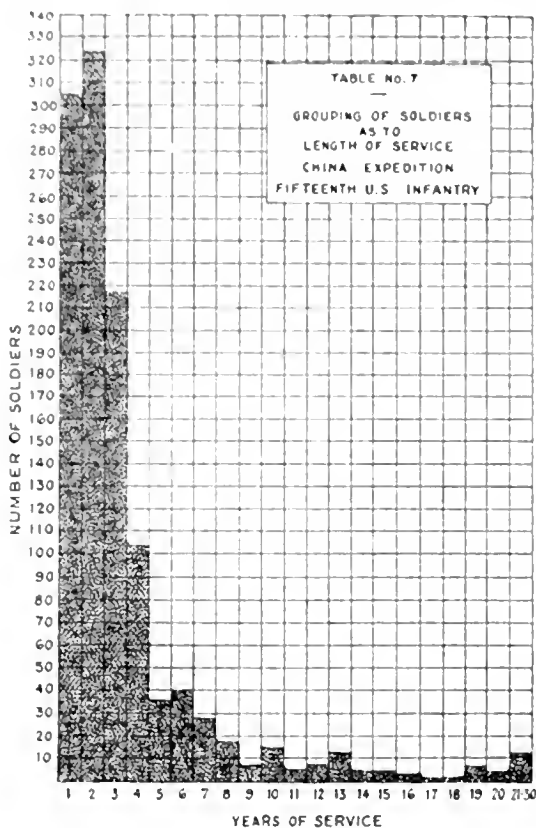


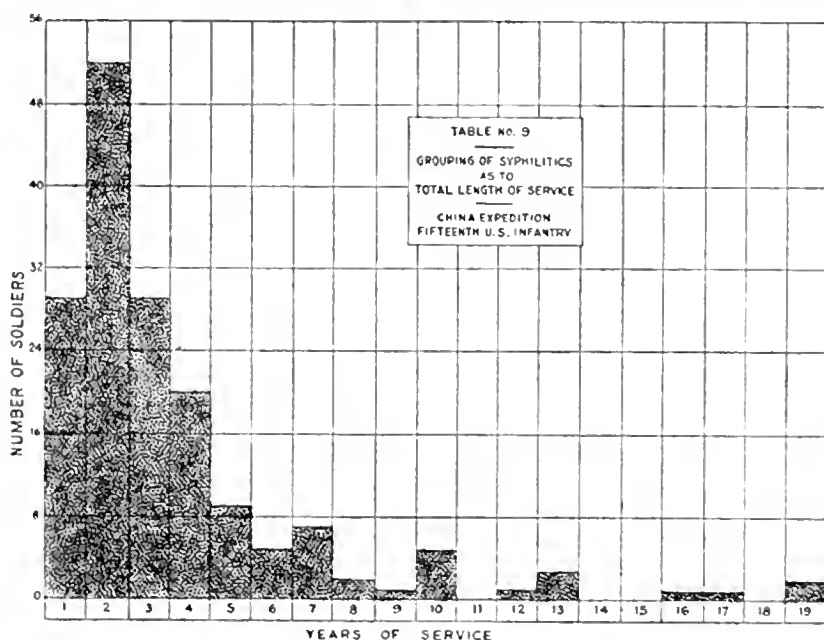
TABLE 8.—PERCENTAGE STRENGTH FOR EACH YEAR OF SERVICE  
CHINA EXPEDITION, FIFTEENTH U. S. INFANTRY

<i>Years' service</i>	<i>Percentage</i>	<i>Years' service</i>	<i>Percentage</i>
1	26.1	15	0.7
2	27.5	16	0.5
3	17.9	17	0.3
4	8.7	18	0.3
5	3.0	19	0.7
6	3.4	20	0.6
7	2.4	21	0.6
8	1.5	22	0.2
9	0.7	23	0.08
10	2.1	24	0.08
11	0.5	25	0.00
12	0.7	26	0.00
13	1.0	27	0.00
14	0.7	28	0.08

Total, 100.00 per cent

In the group comparison between syphilitics of native and foreign birth it was found that there was present a higher rate of infection among the American-born soldiers than in those of foreign birth (Table 6).

The total length of a soldier's service and the bearing which length of service has upon syphilitic infection is a question which frequently has been discussed. In considering this question as applied to the China Expedition a table was first prepared showing the grouping of the enlisted personnel of the forces according to years of service (Table 7). Table 8 shows the percentage of total strength grouped according to years of service. In making these tables fractions were not considered the nearest whole number being used. It was found that over 71 per

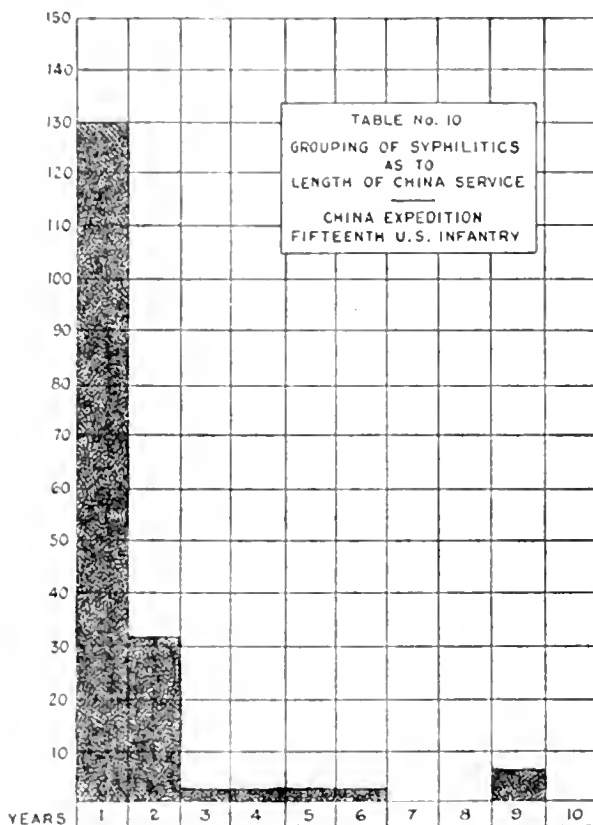


cent of the entire Expeditionary Force had served less than three years. A similar table dealing with the syphilitic group only (Table 9) likewise shows that more than 70 per cent of this group falls within the first three years of service. Only 27 cases of syphilis were noted among soldiers of more than five years' service, and of this number 16 were cases of several years duration.

In Table 10 the syphilitic group is charted according to length of service in the China Expeditionary Forces. Of this group 80 per cent had served in China one year or less, and an additional 15 per cent had served only two years. This is especially important when it is considered that out of the 167 cases of syphilis in the China Expeditionary Forces

148, or 88 per cent, were acquired by the soldiers while serving in China.

In conclusion, the writer is of the opinion that the primary causes for the excessive syphilitic rate among the soldiers of the China Expeditionary Forces are: First, the large number of soldiers serving with the forces who have not as yet reached the age of discretion; second, an excessive average rate of sexual contacts per man, due in part to lack of social diversion; third, the fact that almost all of the prostitutes available for the soldier are infected with some form of venereal disease.



It is believed that the rate could be reduced materially: first, by a careful selection of the soldiers composing the forces, who should be men of excellent character, over twenty-five years of age, and at least in their second enlistment; second, by continual education of the soldier as to the dangers of venereal diseases, the granting of special privileges to the "clean" soldier and an increase in the social welfare work; third, by the establishment of a restricted area under military control, and continuous medical examinations of prostitutes with quarantine of those infected.

# THE PREVENTION OF EXTRA-GENITAL CHANCRES IN THE ARMY, BASED ON A STUDY OF SYPHILITIC REGISTERS ON FILE AT THE ARMY MEDICAL SCHOOLS

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## PREVALENCE OF INFECTION IN THE ARMY

THE FIRST question of interest as regards extra-genital infection in the Army is: How frequently are these infections met with? Are they so infrequent as to be negligible, or, on the other hand, are they so common as to be a special care for the army sanitarian?

To answer these questions, Table I has been prepared to show the actual number of extra-genital chancres by years, the rates per thousand of enlisted strength, a comparison of this rate with the rate per thousand of all syphilitic admissions among enlisted men, and the ratio existing between extra-genital and all admissions for syphilis.

It should be noted that the Syphilitic Register (Form 78, Med. Dept.) was authorized in March, 1911. As it always takes a few months for a new idea to take hold, all cases in 1911 and prior thereto have been eliminated from this table. To insure further a fair basis of comparison, the five years preceding the Great War (1912-1916, inclusive) have been grouped together, and the three years in which the emergency army was mobilized have been grouped by themselves. A great difference is noted in the admission rate per thousand for extra-genital infection in the two groups, being four times as frequent in the ante-bellum days, yet the admission rate for syphilis as a whole remained practically the same. This may be at least partly explained by the fact that the figures for syphilis as a whole were compiled from the Register and Report Cards (Form 52) while the figures for the extra-genital infections were compiled from the Syphilitic Registers. A greater superintendence was observed during the war for the first named records, and it is possible that in the stress of war conditions reserve officers did not always make the Syphilitic Registers, or if made they were not forwarded, were lost in following the soldier from camp to camp, etc.

From this table we must draw the conclusion that the prevalence of extra-genital syphilis in the Army is not of sufficient magnitude to reflect on the sanitation of the past. Yet in view of the nature of the disease, we cannot say that our rates are so low that they do not require our attention in the future.

TABLE I

SHOWING PREVALENCE OF EXTRA-GENITAL INFECTION IN THE U. S. ARMY IN TERMS OF ADMISSION RATES PER M PER ANNUM, AND THE RELATION OF THIS MODE OF INFECTION TO THE USUAL TYPE

Year	Average enlisted strength of the Army (1)	No. of cases extra-genital chancres (2)	Admission rate per M extra-genital syphilis	Admission rate per M syphilis all forms (4)	Ratio of extra-genital to all infections
1912	79,000	10.0	0.126	25.58	1:203
1913	81,000	11.0	0.136	20.99	1:154
1914	88,000	7.0	0.080	18.53	1:231
1915	94,000	9.0	0.096	17.24	1:180
1916	99,000	7.0	0.071	18.36	1:258
Average.	88,000	8.8	0.100	20.14	1:200
1917.	678,000	11.0	0.016	14.22	1:888
1918	2,351,000	15.0	0.019	27.94	1:470
1919	936,000	12.0	0.013	21.36	1:643
Average.	1,322,000	22.7	0.017	21.17	1:1,245

## COMPARATIVE NOTE ON PREVALENCE IN GENERAL

As a matter of interest we may quote the observations of Bulkley (3), who estimated from a series of European clinics that extra-genital infections were from 5 to 10 per cent of all luetic infections. Schener (4) states that 50 to 60 per cent of cases of syphilis in Russia are due to extra-genital infections. Perichitch (5) states that in Serbia this type of infection is common and infection by the genital route is rare. Similar conditions exist in Turkey and Asia Minor according to von During-Pascha (6). In all these regions the disease is not one of immorality so much as one of filth and promiscuity; natives use drinking vessels, the water-pipe and even cigarettes in common, being totally ignorant of modes of transmission of disease. Vedder (7) estimates innocent infection as 5 to 10 per cent of the total. Compared with these figures our series show one-half of one per cent infected with syphilis extra-genitally for the period 1912-1916, considered to be normal years.

## CAUSES OF INFECTION

A further study is indicated to show how these infections have been incurred. Accordingly Table II has been prepared to show the causes of infection correlated with the time of infection—that is, whether infection occurred before or after enlistment, infections of officers compared with enlisted men, and the Medical Department compared with other branches of the service.

TABLE II

SHOWING THE CAUSES OF INFECTION, ACTUAL NUMBER OF CASES OF RECORDED CAUSES BEING SHOWN WITH THEIR PERCENTAGE OF KNOWN CAUSES, AND ALSO OF ALL CAUSES BOTH KNOWN AND UNKNOWN. ALSO THE OFFICERS AND MEN OF THE MEDICAL DEPARTMENT COMPARED WITH ALL OTHER OFFICERS AND ENLISTED MEN

Causes of infection	Infected before entry into service	Infected after entry into service				Time of infection unknown	Totals	Per cent of known causes	Per cent of all infections
		Medical depart.		All others					
		Officers	Enl. men	Officers	Enl. men				
From care of patients.	1	6	9				16	40	11.5
From prostitutes	<div> <div>Bites...</div> <div>Kissing.</div> <div>Other</div> </div>				3				
			1		3		11	27.5	8.0
						3			
From barbers.	1			1	4		6	15	4.2
From dentists					1		1	2.5	0.7
From pipes					1		1	2.5	0.7
From drinking glasses.	1						1	2.5	0.7
From fights	2			1	1		4	10	3.0
Totals.	6	6	10	2	16		40	100	28.8
Causes not recorded	33		6	4	45	11	99		
Grand totals.	39	6	16	6	61	11	139		

Table II shows that "the care of patients" heads the list of the known causes of extra-genital infection, being two-fifths of the known and about one-eighth of both known and unknown causes. Infection direct from prostitutes comes next on the list of known causes, being over one-fourth of known and one-twelfth of all causes. Infection by barbers are 15 per cent of known and 4 per cent of all infections. Infections from fights 10 per cent and 3 per cent respectively of known and unknown infections. The mediate infections from pipes and drinking glasses are comparatively infrequent, as far as is known, being  $2\frac{1}{2}$  per cent of known causes in each case.

#### INCOMPLETENESS OF RECORDS

One perceives with regret from this table that out of 139 cases only 40 (28.8 per cent) have a cause of infection recorded. The two probable reasons for this incomplete state of our records are, first, the real ignorance of the patient concerning the source of his infection, and this in my opinion is responsible for most of the gaps in this record. In a few cases undoubtedly the patient either did not care to reveal the cause to the recording medical officer, or the latter did not deem the

matter of sufficient importance to press for the real reason. Obviously any research obtained from delving in records loses in value if the individual medical officer has not first appreciated his part in the collaboration.

#### INFECTIONS IN OFFICERS

Seven medical and six line officers have shown extra-genital infections. All the infections in medical officers were directly from their patients, one of these cases prior to the entry of the officer into the service. One line officer contracted infection in a fight, and another in a barber shop. The record is blank for the other four. All infections in line officers occurred in officers of the emergency army; five of them were second lieutenants.

#### INFECTIONS IN ENLISTED MEN

The Medical Department normally has 5 per cent of the enlisted strength of the Army, but they received 22 per cent of all extra-genital infections, and over half of these were known to have been innocently contracted while caring for patients suffering from lues.

#### STUDY OF INDIVIDUAL CASES. INFECTIONS FROM PATIENTS.

A study of infection among medical personnel is especially interesting to us and might well be reviewed by cases.

*Case 122.*—Lieut.———. On duty at a large recruit depot; engaged in the eye, ear, nose and throat examination of recruits. While so engaged contracted a chancre of his left thumb; he believed that a hang-nail on his thumb came in contact with an infected tongue-depressor. Secondaries followed. Patient received thorough treatment and is now apparently cured.

*Case 123.*—Capt.———. Following a surgical operation on a syphilitic patient, he scratched a pustule on his shoulder which was followed by the appearance of a chancre; secondaries were observed two months later. Treatment was thorough and an apparent cure was effected.

*Case 124.*—Contract Dental Surgeon. Chancre on his right middle finger; infection occurred from the mouth of a patient. Secondaries followed. Treatment thorough, and apparently the dental surgeon was cured.

*Case 125.*—Maj.———. While operating on a supposedly chancreoidal bubo, this officer pricked his own finger deeply with a needle. The patient subsequently developed symptoms of secondary syphilis. This was in the days when it was considered necessary to observe secondaries before making an absolute diagnosis. Shortly after the operating room accident this officer broke out with a slight rash which he feared might be a secondary eruption, but as it soon faded and no other symptoms developed he did not take treatment whole-heartedly. Received some mercurial treatment but not a thorough course. Paresis developed



after a lapse of seventeen years and resulted in the retirement of this brilliant officer.

*Case 126.*—Lieut.——. Received infection by tearing tissues under the nail of his left index finger while performing an operation on a syphilitic subject. While this also occurred in the days before the treponema was known to us, and before Wassermann's discovery, yet the appearance of marked secondaries caused this officer to avail himself of vigorous treatment and he is now, after a lapse of many years, apparently cured.

*Case 127.*—Capt.——. Contracted a chancre on his left index finger, which infection was received by operating on a syphilitic. Did not recall the actual incident but had been dressing many venereal patients and giving them intravenous medication. Secondaries were well marked in this case. This officer was retired one year later as a result of his infection.

*Case 2.*—O. K. A., Pvt. 1st Cl., Med. Dept., aet. 27. While en route on train to Ancon Hospital, C. Z., in March, 1918, was bitten on the finger by a syphilitic patient whom he was conducting thither for further treatment. Shortly afterward an indurated sore appeared on the bitten finger. No secondaries recorded, but seven months later his blood Wassermann was double plus.

*Case 19.*—W. J. B., Pvt. 1st Cl., Med. Dept. (Dental), aet. 25. Was infected at the 8th Inf. Infirmary, Camp Fremont. The lesion occurred on the left thumb at the outer nail margin and was contracted while working on a patient's mouth. The initial lesion was followed in six weeks by marked secondaries and a double plus Wassermann reaction.

*Case 20.*—C. K. B., Pvt. 1st Cl., Med. Dept., aet. 32. Primary lesion occurred on the mucous membrane of the nostril; it was followed by marked secondaries. The exact time and place of infection not known, but the surgeon in recording this case states that the soldier is a reliable and trusty attendant, that he had been on duty in the venereal dressing room in which he had dressed many venereal cases, and in the opinion of the surgeon the infection was incurred in line of duty from his patients.

*Case 88.*—B. M., Pvt. 1st Cl., Med. Dept., aet. 23. Chancre on index finger left hand, contracted while acting as wardmaster of the venereal ward at Fort Strong, Mass. Treatment was imperfect in this case and tertiaries occurred two years later, for which he was ultimately discharged on a Certificate of Disability, same being in line of duty.

*Case 91.*—R. V. M., Pvt., Med. Dept., aet. 31. Infected on the dorsum of left hand while working in the dressing room at the Post Hospital, Fort Leavenworth, Kans. Wassermann was double plus in one month's time; treatment was prompt and secondaries did not appear.

*Case 116.*—M. R., Pvt. 1st Cl., Med. Dept., aet. 30. Initial lesion on right side of mouth. Infected while working with syphilitic blood in the Wassermann Laboratory at the Department Hospital, Manila, P. I., in 1913. Secondaries were marked in this case, and the blood Wassermann was triple plus.

*Case 143.*—B. F. W., Sgt., Med. Dept., aet. 20. Chancre on the lip, in which treponemata were demonstrated. Had been on duty in

the venereal wards at Camp Gordon, Ga., for several months and the surgeon records that the infection was innocently contracted and was in line of duty.

One is impressed by the insidious nature of the infection in the majority of these cases—an abrasion or a very minor traumatism plus attendance on an infected individual extending over a period of days, results at times in an infection the exact time of which cannot be definitely stated.

#### INFECTIONS FROM BARBERS

The next source of infection most frequently met with in the Army, as far as can be ascertained, is the infection following the minor operation of shaving. It is of interest to note that, of the five cases reported as occurring after enlistment, all were infected outside the continental limits of the United States; three in the Philippine Islands, one in China, and one in France. The actual medium of infection in these cases has not been definitely shown. Reasoner's work on the effect of soap on the *Treponema pallidum* would seem to throw the source of infection on the toilet of the face following the actual shaving(8). In his article he quotes the work of Zinsser and Hopkins (9), who showed the viability of the *Treponema* on wet towels exposed to room temperature and daylight, to be 11½ hours.

Reasoner's conclusion is so much to the point that it might well be quoted here:

The results of these experiments were sufficient to convince me that the organisms of syphilis will not live in the presence of a solution of soap of even a considerable degree of dilution, and that a lather, such as is used in shaving, is sufficient, when brought in contact, to cause their immediate death. It is possible that some of the initial lesions on the face which have been ascribed to the barber may have been transmitted by a towel wet only in water, which towel has served to convey the infection from another patron or perhaps by the barber himself. Another possibility is that the person, immediately after shaving and while still having many minute abrasions on the face, has submitted himself to osculatory salutes from an infected prostitute.

#### MEDIATE INFECTIONS

The one case of infection apparently following a dental operation was in an isolated post of Alaska. The dentist was an itinerant one, such as are at times met with in sparsely settled communities. The soldier, while sitting in the dental chair having a decayed molar treated, felt the burr slip out of the cavity and wound his tongue. In three months time this was an indurated sore with adenitis of the submaxillary glands. A dark field examination was not made, but the blood Wassermann, done at the Letterman Hospital two weeks after the appearance

of the lesion, was triple plus. Prompt treatment followed and secondaries did not appear.

One infection is reported as occurring from the use of a common drinking glass and another as infected from using a comrade's pipe.

*Case 34.*—R. S. D., Recruit. Exhibited a lesion on the tonsil four days after enlisting. Secondaries appeared one month later and the Wassermann was double plus. The soldier stated that three weeks before enlisting he was intoxicated in a house of prostitution and drank beer out of the same glass as a prostitute.

*Case 52.*—B. S. G., Sgt. Cav., aet. 30. Had an abrasion on his lip and, while having this, used the pipe of a man in his company who was being treated for syphilis. An initial lesion appeared which was followed in two weeks by the appearance of secondaries and a double plus Wassermann.

Objection may be raised that the case is not complete against either the drinking glass or the pipe. Again attention is called to the subtle nature of this type of infection and that the victim must at times cast around in his own mind to discover the source of the same. So, if the source and mode of infection be within the realms of possibility and probability, it seems just to accept the cause as related to us by the patient.

Experimentally Gaston and Comandon (10) recovered treponemata from drinking glasses up to half an hour after they had been deposited on the same, even after they had been rinsed in water. This furnishes conditions analogous to those seen at certain soda fountains. It proves that such objects as pipes or glasses, if inoculated with the syphilitic virus contained in a viscid secretion such as saliva, which would delay its drying for a short period, can without question act as media of infection until the virus has dried, which, drying, causes the death of the organism.

#### INFECTIONS DURING FIGHTS

Two of the infections attributed to fights occurred while the recipients were in the service. One was in the case of an officer who, one month after having engaged in a fight in which he injured his right index finger, found a chancre at the site of injury. Two months later secondaries appeared, and the Wassermann was double plus. The other case was that of a soldier detailed as a military police in the segregated district of Vladivostok. While stopping a fight between a soldier and a prostitute he received a deep nail scratch on the chin, which injury was inflicted by the prostitute. This was followed by a chancre on the chin, and two weeks after the initial lesion secondaries appeared, also the Wassermann was double plus. A third case occurred four months

prior to enlistment, but the mode of infection is so typical that it might well be quoted.

*Case 97.*—J. J. M., Recruit, aet. 22. Chancre on dorsal surface of the right middle finger, incurred by striking a man in the mouth and injuring his finger on the teeth of his opponent. The lesion was present but unrecognized when the man was enlisted. Wassermann double plus and general adenitis present. This lesion which had persisted for several months disappeared very quickly under specific treatment.

This is probably the most common mode of infection in fight injuries.

#### EXTRA-GENITAL BUT NOT INNOCENT INFECTION

The cases above reported are all cases of innocent syphilis. There is another mode of infection which, though coming under the head of extra-genital infection, cannot be considered innocent infection. Of the series three men stated that the chancres on the lips, from which they were suffering, were caused by kissing infected women. In one of these cases the soldier stated that the woman had an eruption on her face, shoulders, and arms. Three of the cases were bitten by their paramours; one on the hand, one on the breast, and a third on the neck. All these injuries were followed by chancres, the appearance of secondaries and positive Wassermann reactions. Four other soldiers received infection from prostitutes the exact mode of infection not being recorded, but from the situation of the chancres it is inferred that infection was by direct contact. Of these lesions two were on the lip, another on the chin, and a third on the abdomen.

#### UNNATURAL PRACTICES

In two cases the location of the lesions in the anal region were strongly indicative of unnatural practices, although the causes of infection were not admitted by the patients.

#### LOCATION OF CHANCRES

A study of the exact location of all the chancres in the series is interesting. They were as follows:

<i>Location</i>	<i>Number</i>	<i>Per cent of whole</i>
Buccal infection:		
Lips ..	78	52.5
Tongue	8	5.7
Tonsils	1	2.9
Gums	2	1.4
Mouth	3	2.2
	— 90	— 64.7
Fingers and hands	21	15.1

<i>Location</i>	<i>Number</i>	<i>Per cent of whole</i>
Face infections:		
Nostril ..	2	
Cornea ..	1	
Ear ..	2	
Cheek ..	6	
Chin ..	4	
	— 15	10.8
Body, etc.:		
Neck ..	2	
Arm ..	1	
Breast ..	2	
Abdomen ..	6	
Anal region ..	2	
	— 13	9.4
Grand total ..	139	100.0

## COMPARISON WITH PREVIOUS REPORTS

These percentages are not dissimilar to those collected by Scheuer (11), who analyzed 14,590 cases of extra-genital infection. Of these 2,144 were caused by vaccination, 753 from circumcision, 181 from cupping, 109 from tattooing, and 1,568 from nursing syphilitic children. With these excluded, as they have no counterpart in this series, the remainder show percentages as follows:

	<i>Per cent</i>
Buccal infection ..	65.8
Finger and hands ..	9.5
Face and head ..	19.6
Body, etc. ....	5.1

## LOCATION OF CHANCRE RELATED TO CAUSES

A comparison of the cause of infection with the location of the lesion is given in Table III; this table is furnished that we may compare the known with the unknown.

*Group 1. Infections of the Fingers and Hands.*—The causes of these infections are known in the majority of cases; probably due to the fact that they are more frequently associated with a traumatism. They are, in the military service, caused by infected patients either directly or indirectly; they are also caused by bites and other fight injuries.

*Group 2. Buccal Infections.*—These arise from kissing, shaving and placing infected articles in the mouth. It is probable that a certain percentage of these infections is also caused by unnatural practices.

Buccal infection is the most important of all the groups, being 64.7 per cent of the whole. It is also the most insidious in mode of infection, as the history, as regards the cause, is only complete in one of every

seven cases. When we stop to consider the numerous minor traumatismes to which the mucosae of the lips and mouth are subject, together with the great number of foreign objects which are being continuously brought in contact with the mouth, it is not to be wondered at that buccal infections are so far in the lead.

TABLE III

SHOWING CAUSE OF INFECTION AS RELATED TO LOCATION OF THE INITIAL LESION. THE KNOWN CAUSES AND PERCENTAGES COMPARED WITH THE UNKNOWN, AND ALSO COMPARISON OF PERCENTAGES OF THE LOCATION OF LESIONS WITH SCHEUER'S COMPILATION

Causes of infection	Site of infection				Total
	Fingers and hands	Buccal infection	Face lesions	Body, neck, arms, etc.	
From care of patients..	11	2	1	2	16
From barbers.....		2	3	1	6
From dental instruments.....		1			1
From drinking glasses.....		1			1
From pipes.....		1			1
From fight injuries.....	3		1		4
From { Bites... ..	1			2	3
prosti- { Kissing.....		4			4
tutes. { Other... ..		2	1	1	4
Total cause recorded.....	15	13	6	6	40
Per cent cause recorded..	37.5	32.5	15	15	100
Total cause unrecorded.....	6	77	9	7	99
Per cent cause unrecorded..	6	77.8	9.1	7.1	100
Grand total.....	21	90	15	13	139
Per cent of grand total.....	15.1	64.7	10.8	9.4	100
Scheuer's compilation of (12) extra-genital chancres.....	897	6,178	1,828	477	9,380
	9.6%	65.8%	19.5%	5.1%	100%

*Group 3. Infections of the face* are probably chiefly due to shaving. As has been previously stated, the skin of the face during this operation is subject to slight denudations of the epithelium which furnish ideal sites for inoculation. The infection may occur in the barber chair or, what is very probable, also by caresses on the face received shortly afterward.

*Group 4. Infections on the Body.*—These are generally received direct from prostitutes. The cause is recorded in half the cases and is probably known by the patient in the other half.

## RACIAL INFECTION

As regards *race*, the distribution of infection was as follows:

White enlisted . . . . .	116
Colored enlisted . . . . .	4
Not recorded . . . . .	6

The colored infections were to the white as 1 to 29, while the proportion of colored to white troops was as 1 to 13. The total syphilitic infection in the colored race was, however, much higher than in the white, being for the years 1913-1919, 34 per M colored and only 23 per M white (43).

## PLACE OF INFECTION

As regards the *place* of infection, 19 cases are recorded as occurring on a military post. Of those not occurring on a military post, 64 are recorded as occurring in cities and 14 in rural districts; 27 occurred beyond the limits of continental United States. As regards states, 12 occurred in New York; 7 each in Texas, the Philippine Islands and France; 4 each in Illinois, Indiana and Michigan; 3 each in the District of Columbia, Pennsylvania, Ohio, Virginia, Tennessee, Missouri, Oklahoma, Hawaii, and China; 2 each in Massachusetts, New Jersey, Georgia, Alabama, Kansas and Wyoming; and 1 each in Delaware, Maryland, West Virginia, Louisiana, Wisconsin, Minnesota, Iowa, Nebraska, Colorado, Utah, Oregon, California, Alaska, Panama, Porto Rico, Cuba, Canada, Siberia, and England.

This covers rather thoroughly the regions in which the Army has operated during the period covered by the report, and is merely indicative of the ubiquitous nature of the disease. Of this we have full information, and the matter is interesting rather than pertinent to the discussion.

## INFECTIOUSNESS OF SYPHILIS

Before proceeding to the question of prevention, we may briefly review certain points concerning the infectiousness of syphilis that have in my opinion a definite bearing on innocent infection.

1. A typical chancre, or even a marked sore of long duration, or a florid array of secondaries will warn even the ignorant of the lurking danger. Unfortunately we have ill-defined lesions, we have what might be termed a "carrier stage," wherein the treponema is present without marked pathological change, the dangers of which are certainly not appreciated by the laity and perhaps not to the fullest degree by all the members of the profession. Vedder, in his excellent and exhaustive work on "Syphilis and Public Health, 1918," has brought out in a forcible manner several points which are important in showing that the

syphilitic lesions are by no means dependent on their size nor on their relative age to be the means of infection.

Treponemata are present in chancres of only two or three days' duration (14), long before the sore has taken on the clinical appearance of a chancre and while it yet resembles a simple abrasion. On the other side of the time scale, mucous patches are just as infections when occurring ten years after a chancre as when they appear two months after the primary lesion. Secondary syphilis is of no certain duration and may persist for many years. Buba, Finger, Barthelémy, Fenlard, Newman, Kromayer, Tarassewitch and Tschistjakow (15) quote cases in which secondaries were prominent from six to twenty-nine years after the initial infection. The last-named observer quotes one thousand cases from the clinic of Tarnowski, in which condylomatous lesions developed as follows:

Within the first five years	802 persons
Within the second five years	167 persons
Within the third five years	26 persons
Within the fourth five years	5 persons

Secondary lesions may escape notice (16). Diday (17) emphasizes the frequency of unrecognized buccal mucous patches as sources of infection. The bearers of these are what has been previously referred to as dangerous "carriers."

Tertiary lesions, while admittedly less dangerous, are, when superficial, infectious. Treponemata have been demonstrated in gummata and other tertiary lesions by Doutrelepon and Grouven (18) and Tomaszewski (19). Finger infected apes from gummata (20), and Fournier (21), many years before the discovery of the *Treponema pallidum*, reported a case of a husband with a tertiary glossitis fifteen years after his chancre, infecting his wife on the lip.

2. Infection may reside in the blood of the patient and infection may occur by contact with fresh blood. To support this contention may be quoted the work of Hoffman (22), who produced syphilis in animals by the inoculation of blood taken from cases of syphilis of six weeks, three months, and six months respectively. Uhlenhuth and Melzer (23) obtained successful inoculations in 84.2 per cent of 19 rabbits injected with the blood of patients suffering from primary syphilis, and 75 per cent of 36 rabbits injected with the blood of secondary syphilitics, while injections with the blood of tertiary and latent syphilitics gave 25 per cent in each instance of successful results. In the series of cases under discussion, infection in one of them can be scarcely accounted for in any other way than by blood infection. Case 116, previously quoted, is that of a laboratory assistant who contracted a chancre of his mouth



while working with syphilitic blood in a Wassermann laboratory. As far as we can determine, this man contracted the disease directly from the blood. The evidence in Case 125, also quoted, is not conclusive. In this case the surgeon was operating on a case of primary syphilis, although not recognized by him as such at the time; infection may have occurred from the blood through the deep wound made in his finger by the needle, or again it may have occurred from the bubo on which he was operating, which was probably swarming with spirochaetae. An interesting feature of this case was the fact that there was no primary lesion, indicating the probability of direct infection of the virus into the blood or lymph stream.

3. Treponemata have also been demonstrated in the urine from a case of syphilitic nephritis (24), from spinal fluid and from spermatic fluid (25).

4. The *Treponema pallidum* under favorable conditions of heat and moisture may retain its viability outside the body for considerable periods of time. Reference has already been made to its recovery after one-half hour on drinking glasses, and after eleven and a half hours on wet towels. Its vitality is destroyed by drying. Neisser (26) showed that the virus from syphilities that produced the disease when inoculated into monkeys, absolutely lost its power to transmit the infection as soon as the fluid which contained the organism had dried. The virus is also destroyed, as we all know, by heat and the commoner antiseptics. It is estimated that solutions of corrosive sublimate, trichresol and phenol will kill the treponema in dilutions from twenty to one hundred times higher than are required to kill the colon bacilli (27).

5. There is a possibility that the treponemata can penetrate sound mucous membrane and even unbroken skin. While this has not been proved beyond the peradventure of a doubt, yet no less an authority than Hutchinson admits its probability (28). Reasoner at the Army Medical School succeeded in inoculating rabbits on the untraumatized mucous membrane of the vagina, and Vedder furnishes some excellent arguments in favor of the hypothesis. (Vide "Syphilis and Public Health," pages 124-126.)

#### PREVENTION OF EXTRA-GENITAL INFECTION. OPERATING ROOMS AND WARDS

Based, then, on the knowledge we have gathered of the modes of infection in the Army, we may proceed to the question of prevention.

Foremost comes the prevention of operating room and ward infections. We know more about this form than any other. We owe a great debt to the enlisted personnel under our control when we assign

them the hazardous risk of caring for syphilitic patients, and the only way we can discharge this debt is by most careful and painstaking instruction. Enlisted men should not be permitted to enter on duty in venereal wards until the surgeon so assigning them has satisfied himself that each and every attendant understands fully the nature of the infecting agent, the diverse ways in which the disease may be transmitted, the danger to the attendant of abrasions on their fingers and hands or other parts of the body, and the accurate knowledge of how to accomplish sterilization. The propriety of using rubber gloves when handling infected material should also be impressed on all. Teaching must be by example as well as by precept; all too frequently we observe professional men palpate venereal lesions with bare hands. Operating room infections concern us most personally. About 5 per cent of the series occurred in medical officers. I do not believe these infections were due to gross carelessness; perhaps the guard was lifted because symptoms of the disease were so slight, perhaps because of the preponderating symptoms of a concomitant disease. It is necessary to be ever on the alert against syphilitic infection and it is well for all medical officers in order to protect themselves when handling patients to remember the possibility of "treponema carriers," the viability of the organism outside the human body, and its presence in many of the body fluids with which they may be working—all of which matters have been discussed in the preceding heading.

#### BARBER SHOPS

As regards barber shop infections, the following sanitary points are important and should be looked out for carefully by all sanitary inspectors in the army:

1. In every barber shop there should be running hot and cold water.
2. The barber should wash his hands before serving each customer.
3. Each barber should be examined periodically for luetic lesions.
4. Wash-cloths or towels must not be used on more than one customer without sterilization.
5. The alum stick (which is generally moistened with saliva and applied for hemostasis) should be prohibited. Only powdered or liquid styptics should be used.
6. No customer suffering from skin lesions should be shaved without presenting a note from the surgeon.
7. Sterilization of razors, tweezers, clippers, etc., should be accomplished between each customer by the use of a 5 per cent phenol or trichresol solution, immersion being made for ten minutes.

## CUPS AND UTENSILS

Infection from drinking glasses and other dishes and utensils used in common must be prevented by the sterilization in boiling soapy water or in live steam of all such dishes or utensils used at a mess, post exchange restaurant, or soda fountain. At the latter place the use of paper cups only may be made mandatory. The use of common drinking glasses in offices, orderly rooms, recreation rooms, etc., should not be allowed. Bubbling fountains of the intermittent type should be installed in every barracks or recreation room. These should be furnished by the Quartermaster but may be purchased from company funds if the Quartermaster is without funds for the purpose. The use of individual paper cups for general use, while desirable, is almost prohibitive on account of the cost. Straws should always be furnished for bottled soft drinks; these straws should be kept in a covered container and protected from promiscuous handling no less than from dust and flies.

The old fashioned roller towel should never be allowed in any wash room. Company commanders should see that a sufficiency of paper-toweling is on hand in the toilet rooms under their control.

## INSPECTIONS OF COMMAND

As regards the inspection of the command little need be said. If the bi-monthly inspection is carried out as is contemplated in existing orders with all proper care and thoroughness, at least most of the sources of infection will be eliminated. If it is not carried out with proper care and diligence nothing further that may be said here will be of any avail.

## LECTURES TO COMMAND

Lectures to officers and men on the subject of "Venereal Prophylaxis" should always embrace the subject of extra-genital infection. The great prevalence of mucous patches in cases of secondary syphilis and the extreme danger of these lesions should be strongly emphasized at these lectures. The men from their earliest recruit days should be made to comprehend the various modes of infection. If their cooperation is not obtained by the shedding of this light, then their blood be on their own heads if they obtain extra-genital infection from their paramours, for it is manifest that the provisions of venereal prophylaxis in vogue at present cannot be extended to ridiculous lengths.

## COOPERATION WITH SOCIAL HYGIENE BOARDS

A word should be said regarding cooperation of army sanitarians with the Interdepartmental Social Hygiene Board. This has been

the subject of numerous circular letters from the Surgeon General's Office in the past few years. This board is struggling with many handicaps, despite which it is doing excellent work in hunting up infected individuals reported to them, treating them and in certain cases restraining them. While this may be said to have a greater bearing on the prevention of syphilis in general, yet the subject matter is very closely woven together throughout.

## CONCLUDING NOTE

Criticism may be made that we have reached the irreducible minimum in the Army as far as extra-genital infections are concerned, and that anything further in the line of prevention may be regarded as "straining at a gnat." In my opinion increased vigilance will still further lower, if not entirely eradicate, at least the infection of the innocent.

## REFERENCES

- (1) Reports of the Surgeon General, 1912-1919, inclusive.
- (2) Compiled from Syphilitic Registers (Form 78, Med. Dept.) on file at the A. M. S.
- (3) Bulkley: Syphilis in the Innocent. 1894, p. 25.
- (4) Scheuer: Die Syphilis der Unschuldigen, Berlin, 1910, Urban and Schwartzburg (Vedder).
- (5) Perichitch: La Syphilis en Serbie, Dissertations de la Faculte de Medecine de Nancy, 1901-1902 (Vedder).
- (6) von Düring-Pascha: Studien über Endemische und Hereditäre Syphilis, Archiv. f. Dermatologie und Syphilis, 1902, lxi (Vedder).
- (7) Syphilis and Public Health, 1918, p. 149 (Vedder).
- (8) Reasoner: The Effect of Soap on *Treponema pallidum*. J. A. M. A., vol. lxviii, pp. 97, 973-974.
- (9) Zinsser, Hans and Hopkins, J. G.: The Viability of the *Spirochaeta pallida* in Diffuse Light at Room Temperature. J. A. M. A., June 6, 1914, pp. 1802-3.
- (10) Gaston and Comandon: Preuve donne par l'ultra microscope de la contagion possible de la syphilis par les verres a boire. Bull. de la Soc. Franc. de Dermat. et Syph., 1908, xix, 292.
- (11) Same as (4).
- (12) *Ibid.*
- (13) Same as (1).
- (14) Bulletin No. 8, War Dept., Office of the Surgeon General, p. 10.
- (15) Vedder: Syphilis and Public Health, 1918, p. 113.
- (16) *Ibid.*, p. 138.
- (17) Diday: Le Peril Venerien dans les Familles. Paris, 1881 (Vedder).
- (18) Doutelepoint and Grouven: Ueber den Nachweis von *Spirochete pallida* in tertiär syphilitischen Produkten. Deutsch. Med. Wchnschr., 1906, xxxii, 908 (Vedder).
- (19) Tomaszewski: Ueber den Nachweis der *Spirocheta pallida* bei tertiärer Syphilis. München. med. Wchnschr., 1906, liii, 1301 (Vedder).

(20) Finger and Landsteiner: Untersuchungen über Syphilis an Affen, II Mittheilung. Archiv. f. Dermat. u. Syph., 1906, lxxxi, 147 (Vedder).

(21) Fournier: Echeances du Tertiarsme, Comptes rendus du I Congres de derm. et Syph. Paris, 1889, p. 717.

(22) Hoffman: Die Etiologie der Syphilis, Berlin, 1906, p. 43 (Vedder).

(23) Uhlenhuth und Melzer: Weitere Mittheilungen ueber die Infectiositat des Blutes und anderer Körperflüssigkeiten syphilitischer Menschen f. das Kaninchen. Berl. klin. Wehnschr., 1913 1, 769 (Vedder).

(24) Dreyer und Toepfel: Spirochete pallida in Urin bei syphilitischer Nephritis. Dermat. Centralbl., 1906, No. 6, 172 (Vedder).

(25) Nichols, H. J.: Observations on the Pathology of Syphilis. J. A. M. A., 1914, lxiii, 466.

(26) Neisser: Pathologie und Therapie der Syphilis, Berlin, 1911 (Vedder).

(27) Vedder: Syphilis and Public Health, 1918, p. 123.

(28) Hutchinson: Syphilis. Cassell and Co., 1909, p. 31.

## The Henry S. Wellcome Prizes

Competition open to all medical officers and former medical officers of the Army, Navy, Public Health Service, Organized Militia, U. S. Volunteers, and of the Reserves of the United States:

**PRIZE FIRST: A GOLD MEDAL AND \$300**

**PRIZE SECOND: A SILVER MEDAL AND \$200**

Competition for 1922 will be based on essays on prescribed subjects, as follows:

**First Prize.**—"A Plan for the Correlation of the Three Federal Medical Services in Preparation for War, During the Continuance of Hostilities and Through the Subsequent Period of Reconstruction."

**Second Prize.**—"Influences of the World War on the Development of Civil Practice."

Each competitor must furnish five copies of his competitive essay. Essays must not be signed with the true name of the writer, but are to be identified by a *nom de plume* or distinctive device. They must be forwarded to the Secretary of the Association of Military Surgeons of the United States, Army Medical Museum, Washington, D. C., so as to arrive at a date not later than September 15, 1922, and be accompanied by a sealed envelope marked on the outside with the fictitious name or device assumed by the writer and enclosing his true name, title and address. Essays must contain not less than 5,000 nor more than 20,000 words, exclusive of tables. The envelopes accompanying the winning essays will be opened at the annual, or other meeting, by the president, and the names of the successful contestants announced by him. The winning essays become the property of the Association and will be published in THE MILITARY SURGEON. The writers of the essays receiving "first honorable mention" will be awarded life membership in The Association of Military Surgeons, U. S.

# A MODIFICATION OF THE WASSERMANN TEST

BY CAPTAIN R. E. HOUKE

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IN PRESENTING the following addition to the already large number of modifications of the complement fixation reaction, used as diagnostic aids in syphilitic infection, no claims are made that in it will be found the panacea for the ills of the systems at present in use, but rather a test bordering so closely upon the experimental as to make it applicable only in cases of extreme emergency.

As the author's test makes use of the specific agglutination taking place between certain of the four blood groups or types, among which all individuals are divided, a brief outline of the main characteristics of these groups, taken from the Medical War Manual No. 6, published by the Surgeon General of the Army, will be quoted.

*Group 1* (5 per cent of individuals).—Serum hemolyses cells of no other group. Cells hemolysed by all other groups.

*Group 1* (40 per cent of individuals).—Serum hemolyses cells of groups 1 and 3. Cells hemolysed by sera of groups 3 and 4.

*Group 3* (10 per cent of individuals).—Serum hemolyses cells of groups 1 and 2. Cells hemolysed by sera of groups 2 and 4.

*Group 4* (45 per cent of individuals).—Serum hemolyses cells of groups 1, 2 and 3. Cells hemolysed by sera of no other groups.

A series comprising one hundred sera, taken at random from those sent to the laboratory for Wassermann tests, were tested for their hemolytic activity upon group 1 erythrocytes, group 1 sera being excluded.

All sera were first inactivated and tubes set up as indicated.

Serum (inactivated).....	0.2 c. c.
Guinea-pig complement (1-20).....	1.0 c. c.
Group 1 erythrocytes (5 per cent).....	0.1 c. c.
Water bath one hour at 37° C.	

*Control No. 1:*

Serum (inactivated).....	0.2 c. c.
Physiological saline.....	1.0 c. c.
Cell suspension.....	0.1 c. c.

*Control No. 2:*

Guinea-pig complement (1-20).....	1.0 c. c.
Cell suspension.....	0.1 c. c.
Physiological saline.....	0.2 c. c.

The results obtained from these experiments are tabulated in the following table:

Tientsin, China

	Group 2	Group 3	Group 4	Control 1	Control 2
100 per cent hemolysis.	18	0	30	0	0
75 per cent hemolysis.	12	8	12	0	0
50 per cent hemolysis.	2	2	0	0	0
25 per cent hemolysis.	8	2	0	0	0
No hemolysis.	0	4	2	0	0
Total sera tested	40	16	44		

Of the three groups tested, group 4 shows the greater hemolytic activity, 68.1 per cent of this group giving complete hemolysis and an additional 27.2 per cent showing over 75 per cent hemolysis. Group 2 was the next most active group hemolytically, 75.6 per cent of this group showing over 75 per cent hemolysis. Group 3 was the least active, slightly over 50 per cent of this group showing over 75 per cent hemolysis.

This difference in hemolytic activity is explained by the fact that, while each serum contains specific amboceptors for the erythrocytes of certain other of the blood groups, there is, due to the close relationship existing between all of the erythrocytes, likewise a close relationship between their specific amboceptors. Therefore in a serum there is not only present the action of the specific amboceptor but also the combined or group reaction. Type 4 serum, containing amboceptors for three of the erythrocyte groups, would naturally show the greater hemolytic activity. The amboceptors present naturally in the human sera for the erythrocytes of the lower species do not enter this reaction, since there is not the close relationship as between the various groups in man.

Since, in the author's test, dependence for the hemolytic system is placed upon the natural amboceptors present in 95 per cent of the human sera (groups 2, 3 and 4) for the erythrocytes of group 1, the great difficulty encountered is the uncertainty as to the exact amboceptor content of a serum; however, "within certain limits, the quantitative relationship existing between the absolute amount of complement and amboceptor required to produce complete hemolysis is such that an increase of one factor, say complement, permits the use of a lesser amount of the other factor, i.e., amboceptor. The hemolysis produced is merely the relative expression of the combined action of amboceptor and complement, and is not the absolute indication of the hemolytic components in a serum" (Noguchi).

*The Test.*—It is first necessary to type all cases, since those individuals belonging to group 1 are excluded from this test, there being no natural amboceptors in their serum for group 1 cells. Either inactivated or non-

inactivated serum may be used, the latter preferably, since in the process of inactivation a certain amount of antibody content is removed.

*Complement.*—Guinea-pig serum in a 1-20 dilution furnishes the complement and is used in either the inactivated or noninactivated serum. Human serum, after being exposed to the air for over six hours, contains such a small amount of natural complement that it may be disregarded. Complement should, of course, be titrated before each test.

*Antigen.*—Alcohol extract of human heart fortified by saturation with cholesterol.

*Hemolytic System.*—A 5 per cent suspension of human erythrocytes belonging to group 1, and the natural amboceptors for these cells present in the human sera.

*Procedure.*—Two tubes are used in the test, one for the test and one for the control. Controls of both antigen and complement are carried in addition. The tubes are arranged as indicated.

*Front Tube*

Patient's serum (inactivated or noninactivated)	0.2 c.c.
Complement (guinea-pig serum, 1-20)	1.5 c.c.
Antigen	0.2 c.c.
Normal saline solution	1.0 c.c.

*Rear Tube*

Patient's serum	0.2 c.c.
Complement	1.5 c.c.
Normal saline solution	1.2 c.c.

Incubate in water bath thirty minutes at 37° C. Add to both tubes 5 per cent suspension group 1 erythrocytes.

Incubate in water bath one hour at 37° C.

NOTE: Complement added in excess to make up for possible deficiency in amboceptor content.

Tests are read according to the following standard:

Plus plus	Complete absence of hemolysis.
Plus	Less than 50 per cent hemolysis.
Plus minus	Over 50 per cent hemolysis but not complete.
Minus	Complete hemolysis.

(All reading refers to front tube.)

Using this system the author has made four series of tests upon a total of 175 sera. The patients were not selected, but were those coming to the laboratory for routine Wassermann tests. At the same time a routine Wassermann was performed, as well as the author's test. The comparative results of each series of tests, as well as a summary of the results obtained from the four series, will be given.



Series 1

		Author's test	Routine Wassermann
<i>Typing:</i>	Sera received . . . . .	50	50
Type 1. . . . . 2	Sera tested . . . . .	45	50
Type 2. . . . . 18	Plus plus . . . . .	4	4
Type 3. . . . . 9	Plus . . . . .	2	2
Type 4. . . . . 21	Plus minus . . . . .	1	0
	*Unreadable . . . . .	5	0
Total . . . . . 50	Minus . . . . .	36	44

Series 2

		Author's test	Routine Wassermann
<i>Typing:</i>	Sera received . . . . .	64	64
Type 1. . . . . 0	Sera tested . . . . .	64	64
Type 2. . . . . 24	Plus plus . . . . .	11	10
Type 3. . . . . 2	Plus . . . . .	3	4
Type 4. . . . . 38	Plus minus . . . . .	3	1
	Unreadable . . . . .	6	1
Total . . . . . 64	Minus . . . . .	41	48

Series 3

		Author's test	Routine Wassermann
<i>Typing:</i>	Sera received . . . . .	40	40
Type 1. . . . . 1	Sera tested . . . . .	39	40
Type 2. . . . . 18	Plus plus . . . . .	3	4
Type 3. . . . . 0	Plus . . . . .	10	11
Type 4. . . . . 21	Plus minus . . . . .	0	0
	Unreadable . . . . .	3	0
Total . . . . . 40	Minus . . . . .	23	25

Series 4

		Author's test	Routine Wassermann
<i>Typing:</i>	Sera received . . . . .	21	21
Type 1. . . . . 0	Sera tested . . . . .	21	21
Type 2. . . . . 11	Plus plus . . . . .	6	5
Type 3. . . . . 4	Plus . . . . .	3	2
Type 4. . . . . 9	Plus minus . . . . .	0	2
	Unreadable . . . . .	1	0
Total . . . . . 21	Minus . . . . .	14	12

Summary of the Four Series

	Author's test	Routine Wassermann
	<i>Per cent</i>	<i>Per cent</i>
Available for test † . . . . .	97.72	100.00
Plus plus . . . . .	13.68	13.11
Plus . . . . .	10.26	10.83
Plus minus . . . . .	2.28	1.71
Unreadable . . . . .	8.55	0.57
Minus . . . . .	63.27	73.53
Available efficiency . . . . .	89.17	99.43

\*Hemolysed or no hemolysis in control.

†Less type 1 blood.

*Conclusion.*—In the above table it has been shown that in using the author's test there is an available efficiency of 89 per cent. This figure is very likely to prove misleading, as only four series of tests were considered in the compilation. In routine practice this percentage would be greatly reduced, scarcely exceeding 50 per cent. This is dependent upon the fact that many sera of groups 2, 3 and 4 are relatively weak in hemolytic properties, due either to a low amboceptor content for group 1 erythrocytes, or to the presence within the sera of anti-hemolytic amboceptors. Repeated tests upon sera of this character, for hemolytic properties, have demonstrated that increased amount of serum or complement are without influence to increase hemolytic activity.



## MILK-BORNE EPIDEMIC OF TYPHOID FEVER AT FORT McPHERSON, GA.<sup>1</sup>

BY MAJOR A. T. COOPER, MAJOR N. F. CURTIS, AND MAJOR R. SKELTON  
*Medical Corps, United States Army*

THE MILK supply for the post of Fort McPherson, Ga., is obtained from a single large dairy located about 70 miles from Atlanta, Ga. It is shipped to Atlanta by rail, where it is pasteurized by a local milk dealer, according to directions established by this laboratory which consist, briefly, in rapidly raising the temperature to 145° F.; hold for thirty minutes; cool rapidly and ice. The milk is delivered to the post in bulk and is bottled at the Post Exchange. Both the milk dealer who pasteurizes the milk and the post exchange are equipped with thoroughly modern and sanitary milk machinery, all of which can be readily sterilized by live steam. Samples of milk for bacteriological examination are obtained before bottling as a check on the milk dealer and his method of pasteurization, as well as after bottling, in order to check the cleanliness of the bottling process at the Post Exchange.

Over a period of three years the above post milk supply has been very satisfactory and no case of illness has been traced to it. The routine bacteriological examinations of this milk performed at this laboratory over a long period show a colony count ranging between 500 and 500,000 bacteria per c.c., with an average count of about 10,000. Hemolytic streptococcus has been found twice. *B. coli* is usually present in 1 c.c. samples.

During the summer of 1921 a number of families, including a few officers, but principally warrant officers, field clerks and enlisted men, discontinued the use of the above safe milk and purchased milk from a number of small milk dealers who came into the post and delivered milk at their homes. These families stated that the Post Exchange milk was objectionable because it had a cooked taste (pasteurized) and that it could only be obtained by going for it, whereas the other milk was unpasteurized and was delivered at their door. These small milk dealers, learning that they could dispose of their milk more readily if they could display a laboratory report thereon, delivered samples of their milk at the laboratory about twice each week.

The bacteriological examination of these samples, even during the summer months, was unusually low, averaging between 2,000 and 5,000 bacteria per c.c.—somewhat better than the Post Exchange milk.

<sup>1</sup>From the Laboratory, 4th Corps Area, Fort McPherson, Ga.

Hemolytic streptococci were never found; *B. coli* was usually present in 1 c.c. samples.

On October 18, 1921, the laboratory was notified that the wife of one of the small milk dealers mentioned above had died the previous evening with what he believed was typhoid fever and that two of his children were also sick with typhoid fever. This milk dealer was a Mr. B—, who had been delivering milk at Fort McPherson for about six months.

A post memorandum was issued advising all civilians on the post who had not received the typhoid inoculation within three years to report to the attending surgeon for such inoculation and prohibiting all milk dealers from entering the post except the Post Exchange supply.

A sample of Mr. B—'s milk obtained October 19 showed 1,500 colonies per c.c.; no hemolytic streptococci; *B. coli* present on 0.1 c.c. samples. A special effort was made to find *B. typhosus* in this sample. Direct smears of the whole milk were made on Endo plates; 5 right-angle glass spreaders were used to inoculate 25 plates, each spreader being used through 5 plates in order to obtain individual colonies. These plates were negative for typhoid-like colonies. The balance of the sample, about 450 c.c., was placed in a flask and incubated for six hours, when a sterile solution containing 13.5 gms. powdered desiccated ox-bile, 36 c.c. of water, 4.5 c.c. of a 0.1 per cent aqueous solution of crystal violet was added to the flask and further incubated for twenty-four hours. The contents of the flask were then divided into four lots, and two sets of five Endo plates were spread from each lot. (Kitasato, Arch. Exp. Med., 2, 219-35, 1918.) A number of suspicious colonies were picked from these plates to Russell media, but all proved negative for the typhoid group.

An inspection of Mr. B.'s dairy showed the following conditions: C. B., a married son who lives at a distance from the dairy, took sick with fever, as he expressed it, soon after July 4, 1921. His wife also became ill with fever at the same time. They were sick at their own home for three weeks when, for financial reasons, they both moved to the father's home, i.e., the location of the dairy. Both were nursed by M. B., mother of C. and wife of the dairyman, Mr. B. The doctor attending did not diagnose typhoid fever. Both cases recovered about August 15 and C. went to his work but relapsed after one week, when he returned to the dairy where he was nursed by his mother and where he remained sick until about the time of her death on October 17. C. was undoubtedly sick with typhoid fever at the location of the dairy during July, August and September and still there convalescing during October. His wife probably had typhoid fever also, although

this remains unproven. The source of infection could not be determined. Feces and urine specimens from both C. and his wife were negative for *B. typhosus* on November 9, 10 and 11. Blood serum for macroscopic Widal was finally obtained from C. on November 28 and gave a double plus agglutination with stock typhoid culture in dilution 1 to 160, single plus 1 to 320, negative 1 to 640 (see chart 1).

CHART 1

MACROSCOPIC AGGLUTINATION-SERUM, C. AND E. B., USING STOCK LABORATORY CULTURES

Serum dilution	20	40	80	160	320	640
C. B. Typhoid.....	++	++	++	++	+	-
Para A.....	-	-	-	-	-	-
Para B.....	+	+-	+-	-	-	-
E. B. Typhoid.....	++	++	++	++	++	-
Para A.....	-	-	-	-	-	-
Para B.....	++	++	+	-	-	-

A second son, R. B., aged 18, was sick with fever during September and early in October. Definite information as to dates of his illness or symptoms could not be obtained; he was not attended by a physician although he was sufficiently ill to require treatment in bed. Like C., he also was nursed by his mother at the location of the dairy. Feces and urine specimens were negative for *B. typhosus* on November 9 and 10. Blood serum for macroscopic agglutination could not be obtained, as he objected vigorously. From all the evidence gathered it is believed that R. contracted typhoid fever from C.

The mother, M., aged 52, became ill on October 3 and died on October 17 following severe hemorrhage from the bowel. The physician attending did not diagnose typhoid fever, but a consulting physician did, and the following day he notified this laboratory and others on B.'s milk route.

A third son, A., aged 12, contracted typhoid on October 15. Feces and urine specimens were negative for *B. typhosus* on November 8 and 9. He refused to permit one of us to take a sample of blood for macroscopic agglutination.

A daughter, E., aged 14, contracted typhoid fever on October 15, the same date as A. Urine specimen was negative, but a feces specimen obtained on November 8 was positive for *B. typhosus*. Blood serum obtained on November 28 gave a double plus agglutination with stock *B. typhosus* in dilution of 1 to 320 (see chart 1).

Beyond peradventure the typhoid history at the B. homestead was a continuous chain of infection from the married son C., possibly through the brother R., but at any rate to the mother M., who nursed the two boys, and then on to the children A. and E., who nursed the mother. Over a period of three months the B.s were exposed to infection among themselves and through their milk acutely liable to spread infection to others. Both contingencies actually did occur. It seems a pity, that such conditions can exist considering the present-day methods for the accurate diagnosis of typhoid fever as well as the great value of the typhoid prophylactic.

CHART 2  
ABSORPTION TEST USING SERUM OF C. B. AND E. B.

	Serum, C. dilutions			Serum, E. dilutions		
	50	100	200	50	100	200
Culture isolated from:						
W. D. ....	—	—	—	—	—	—
R. F. ....	—	—	—	—	—	—
M. H. ....	—	—	—	—	—	—
D. K. ....	—	—	—	—	—	—
I. L. ....	—	—	—	—	—	—
R. L. ....	—	—	—	—	—	—
E. B. (control) .....	—	—	—	—	—	—
Stock Lab. Ty. ....	—	—	—	—	—	—

NOTE.—Three dilutions of each serum were absorbed with a rather heavy emulsion of the culture of *B. typhosus* isolated from E. B. Incubate at 50° C., for two hours. Let sit overnight and then decant the clear top serum to which is then added a rather light emulsion of all the cultures isolated during the epidemic. Again incubate at 50° C., for two hours. Read the following a. m.

The above test was repeated, using the same serums but absorbing them with an emulsion of the culture isolated from R. F. The same negative result as above was obtained.

The above absorption tests would appear to indicate that the culture isolated from the feces of E. B. was biologically identical with all the cultures isolated during the epidemic and with the stock laboratory culture.

The first case of typhoid fever at Fort McPherson developed the earliest symptoms of the disease on October 22 (see chart 3). The incubation period of typhoid is 7 to 23 days, usually 10 to 14 (U. S. P. H. S., Treasury Dept., Misc. Pub. No. 24). Considering the limits of 7 to 23 days for the incubation period, the earliest developed case at Fort McPherson, M. H., October 22, must have been infected between October 1 and 15. So also the latest developed case, R. F., November 2, must have been infected between October 10 and 26. Since the milk

was stopped on the 18th, the period of infectivity would appear to lie between the dates October 1 and 17. If all of the cases were infected on the same day, the period of infectivity of the milk would lie between October 10 and 15. With the exception of the first case, viz., M. L., October 10, which case did not occur on the post, all of the cases studied herein might have been infected during this period, October 10 to 15.

The exact date and mode of infection of the milk at the dairy could not be definitely determined—there were so many possibilities. Mr. B., senior, never contracted the disease, and two examinations of his feces and urine were negative. He claims he never helped nurse his wife and hardly ever entered the sick room, but that she was nursed by the children, R., A., and E. During the period of milk infectivity, October 1 to 17, R. assisted with the milking along with the father, the mother was ill in bed, the children A. and E. washed the milk pans and bottles until they themselves became ill on the 15th. Efforts to prove R. a carrier were futile. A. and E. might have contracted the disease themselves through the milk, although they probably contracted it while nursing the mother and at the same time infected the milk pans and bottles during the washing process.

The sanitary surroundings at the home were bad. The rear was of the French type, i. e., no pit was dug, but the excreta were deposited on the ground and the mass removed at intervals and buried. Water was obtained from a well located within 6 feet of the house and within 40 feet of the rear. The milk bottles were washed each evening in an ordinary galvanized iron wash-tub which was placed conveniently near the well, the water being heated by raising the tub on a few stones and building a small wood fire beneath it. Four separate samples of this well water were examined according to standard methods. The bacteriological analyses showed gas in all lactose fermentation tubes, including 0.1 c.c., within 24 hours, subcultures from which produced red colonies on Endo. *B. coli* were isolated which fermented both dextrose and saccharose; Voges Proskauer and methyl red tests negative. The average count for the four samples was 250 colonies per c.c. A special effort was made to isolate *B. typhosus* in the well water, and all four samples were examined as follows. To 100 c.c. suspected water add a sterile solution containing 1 gm. peptone, 2.5 gms.  $\text{Na}_2\text{HPO}_4$ , 0.5 gm.  $\text{NaCl}$ , and 10 c.c. water. Incubate 8 hours, then add a sterile solution of 3 gms. powdered desiccated ox-bile, 8 c.c. water, 1 c.c. of a 0.1 per cent aqueous solution of crystal violet. Incubate further for 10 to 16 hours and plant on Endo plates. (Kitasato, Arch. Exp. Med., 2, 219-35, 1918). Endo plates were planted after 24 and 48 hours but no typhoid bacilli were found.

CHART 3  
TYPHOID FEVER CASES ALONG MILK ROUTE ARRANGED ACCORDING TO DATE OF OCCURRENCE

Name	Date of typhoid inoculation	Blood culture date positive	Age in years	Date of appearance of first symptoms	Date of admission to hospital	Feces exam., date of positives	Feces exam., number of negatives	Urine exam., date of positives	Urine exam., number of negatives
M. L. <sup>1</sup>	0	Yes <sup>2</sup>	12	Oct. 10	No	0	3	0	1
W. S. <sup>1</sup>	0	Neg. <sup>4</sup>	1½	Oct. 21	No	0	3	0	2
M. H.	0	Oct. 26	30	Oct. 22	Oct. 25	Nov. 20	19	0	31
D. K.	0	Neg.	1	Oct. 23	Nov. 3	Nov. 14	21	0	21
						Nov. 15			
						Nov. 17			
F. K. <sup>3</sup>	0	Neg.	7	Oct. 23	Nov. 3	0	18	0	20
R. L.	0	Nov. 3	4	Oct. 25	Oct. 27	Nov. 7	20	0	13
I. L. <sup>1</sup>	1916	Neg.	41	Oct. 25	Nov. 5	Nov. 22	25	Nov. 14	4
								Dec. 16 <sup>4</sup>	
W. D. <sup>7</sup>	0	Neg.	5	Oct. 31	Dec. 13	Dec. 16	4	0	4
R. F. <sup>4</sup>	0	Nov. 6	17	Nov. 2	Nov. 5	Nov. 21	29	Nov. 27	26
		Dec. 12							

<sup>1</sup> Non-military civilians not living at Ft. McPherson.      <sup>3</sup> Positive, Atlanta Board of Health.

<sup>2</sup> Specimens not obtainable.      <sup>4</sup> Negative, Atlanta Board of Health

<sup>5</sup> Blood, urine, feces negative; case not proven.

<sup>6</sup> Pure culture (practically) on Lido from Nov. 14 to Dec. 16 daily and still positive at date of report.

<sup>7</sup> Fever for 1 month beginning Nov. 1. Not confined to bed. Tonsillectomy in hospital (one day) Nov. 27. No fever for 1 week commencing Dec. 1. Relapse on Dec. 8. Admitted to hospital for typhoid on Dec. 13. Positive feces Dec. 16.

Fever down to normal on Nov. 26. Relapse on Nov. 30. Fever still continues at date of this report.

NOTE.—88.8 per cent of the cases occurred in uninoculated individuals. I. L. was inoculated in 1916, over five years previously, and in addition is weak and anemic and a tubercular suspect, for which reason she drank over a quart of milk daily.

Excluding the first two cases, who were not available for intensive study, the remaining seven cases gave a positive blood culture in 42.8 per cent. *B. typhosus* was isolated in the feces in 85.7 per cent and in the urine in 28.5 per cent. In no case was the urine or feces positive until three weeks after the onset. One case, I. L., might possibly furnish a carrier.

The Surgeon General's office has recently stressed the fact that in reporting the results of any investigation, all the facts from which conclusions are drawn should be reported and in such form as to permit analysis by others, and comparison with similar investigations; even though some of it is considered non-essential by the writer, such information may become quite valuable when compared with similar data from other sources (*Medico-Military Review*, Nov. 15, 1921). This epidemic offered four definite entities:

1. A milk-borne epidemic.

2. A more or less sharply defined period during which the milk was infective.



3. Practically every individual who used the milk during this period could be interviewed.

4. These individuals included both inoculated (military) and non-inoculated (civilian).

Every effort was made to interview every individual who could possibly have used the milk during the period of milk infectivity, and it is believed that the following chart includes all of these, arranged alphabetically.

CHART 4

ALPHABETICAL LIST OF INDIVIDUALS WHO DRANK THE MILK DURING THE PERIOD OF MILK INFECTIVITY, OCTOBER 1 TO OCTOBER 17, 1921

Name of family	Quarts milk daily	Individuals in family <sup>1</sup>	Age	Date last typhoid inoculation	Total typhoid cases.	Inoculated			Not inoculated		
						Adults	Children to 12 yrs. incl.	Ty. cases.	Adults	Children to 12 yrs. incl.	Ty. cases.
B., Sgt.	2	F	40	1919	...	1					
		M	34	1915	...	1					
B., W. O.	2	F	38	1918	...	1					
		M	27	No	...				1		
C., Sgt.	1/2	F	50	1918	...	1					
		M	30	No	...				1		
E., C. D.	2	S	3	No	...					1	
		F	32	1918	...	1					
		M	30	1916	...	1					
		D	13	1916	...	1					
		S	10	1916	...		1				
		D	8	No	...					1	
D., Sgt.	1	S	2	No	...					1	
		F	35	1918	...	1					
		M	31	1918	...	1					
		S	5	No	1					1	1
F., W. O.	2	D	2	No	...					1	
		F	39	1919	...	1					
		M	37	No	...				1		
		D	17	No	1				1		1
		D	12	No	...					1	
		S	10	No	...					1	
H., W. O.	1	F	36	1919	...	1					
		M	30	No	...				1		
H., F. C.	1	F	26	1919	...	1					
		M	21	No	1				1		1
		S	2	No	...					1	
K., Sgt.	3	F	30	1918	...	1					
		M	36	No	...				1		
		G	69	No	...				1		
		G	45	1919	...	1					
		S	7	No	1					1	1
		S	4	No	1					1	1

<sup>1</sup>F, father; M, mother; S, son; D, daughter; G, guest; Ser., servant; G. M., grandmother

CHART 4 (Continued)

Name of family	Quarts milk daily.	Individuals in family. <sup>1</sup>	Age	Date last typhoid inoculation.	Total typhoid cases	Inoculated			Not Inoculated		
						Adults	Children to 12 yrs. incl.	Ty. cases	Adults	Children to 12 yrs. incl.	Ty. cases
L., W. O . . . . .	2	F	45	1919		1					
		M	41	1916	1	1		1			
		D	12	1916			1				
L., Sgt. . . . .	3	S	8	1916			1				
		F	40	1918		1					
		M	43	No					1		
		S	11	No						1	
		D	8	No						1	
		D	5	No						1	
		S	4	No	1					1	1
M., C. . . . .	2	S	2	No						1	
		F	52	1918		1					
		M	46	No					1		
		G. M.	71	No					1		
		D	26	1920		1					
		D	21	1920		1					
		Ser	34	No					1		
M., Sgt. . . . .	2	F	37	1921		1					
		M	33	1921		1					
		G. M.	74	No					1		
		D	11	1921			1				
		D	6	1921			1				
P., C. E . . . . .	1½	D	4	1921			1				
		F	28	1918		1					
		F	46	1918		1					
		M	40	1918		1					
		S	20	1919		1					
R., Sgt. . . . .	2	S	19	1919		1					
		Ser	34	No					1		
		F	30	1919		1					
		M	20	No					1		
		S	2	No						1	
S., G. E. . . . .	1½	F	50	No					1		
S., Sgt. . . . .	1	F	40	1918		1					
		M	33	No					1		
		S	8	No						1	
S., C. E. . . . .	½	D	1	No						1	
S., C. E. . . . .	½	F	28	No					1		
S., C. E. . . . .	½	F	30	No					1		
S., W. O . . . . .	½	F	40	1920		1					
		M	36	No					1		
		S	15	No					1		
S., W. O . . . . .	½	F	39	1918		1					
		M	37	1918		1					
		D	13	1918		1					
		D	1½	No						1	
Telegraph office 4 enlisted men . . . . .	½	F	30	1920		1					
		F	22	1921		1					
		F	20	1921		1					
		F	24	1921		1					

<sup>1</sup> F, father; M, mother; S, son; D, daughter; G, guest; Ser., servant; G. M., grandmother.

CHART 4 (Continued)

Name of family	Quarts milk daily	Individuals in family <sup>1</sup>	Age	Date last typhoid inoculation	Total typhoid cases	Inoculated			Not Inoculated		
						Adults	Children to 12 yrs. incl.	Ty. cases	Adults	Children to 12 yrs. incl.	Ty. Cases
W., C. E. ....	3	F	45	1921	...	1	...	...	...	...	...
		M	40	1921	...	1	...	...	...	...	...
		D	15	1921	...	1	...	...	...	...	...
		D	13	1921	...	1	...	...	...	...	...
W., W. O. ....	1	D	7	1921	...	...	1	...	...	...	...
		F	30	1918	...	1	...	...	...	...	...
		M	28	1915	...	1	...	...	...	...	...
		S	8	No	...	...	...	...	1	...	...
		D	7	No	...	...	...	...	1	...	...
		D	6	No	...	...	...	...	1	...	...
Q. M. Mess: 5 enlisted men....	1½	S	2	No	...	...	...	...	1	...	...
		F	22	1920	...	1	...	...	...	...	...
		F	26	1921	...	1	...	...	...	...	...
		F	24	1919	...	1	...	...	...	...	...
		F	29	1918	...	1	...	...	...	...	...
		F	19	1921	...	1	...	...	...	...	...
Total at Fort McPherson, Ga. ....	36½	.....	.....	.....	7	48	7	1	21	23	6

## NON-MILITARY CIVILIANS NOT RESIDING AT FORT MCPHERSON

A. ....	1½	F	45	No	...	...	...	...	1	...	...
		M	40	No	...	...	...	...	1	...	...
		S	12	No	...	...	...	...	...	1	...
A. ....	1½	F	46	1917	...	1	...	...	...	...	...
		M	35	No	...	...	...	...	1	...	...
		S	14	1920	...	1	...	...	...	...	...
		S	12	1920	...	...	1	...	...	...	...
		S	8	1920	...	...	1	...	...	...	...
B. ....	2	D	5	No	...	...	...	...	...	1	...
		F	35	No	...	...	...	...	1	...	...
		M	28	No	...	...	...	...	1	...	...
		S	6	No	...	...	...	...	...	1	...
C. ....	5	D	4	No	...	...	...	...	...	1	...
		F	29	1920	...	1	...	...	...	...	...
		M	24	1920	...	1	...	...	...	...	...
		G	20	1918	...	1	...	...	...	...	...
		G	22	1920	...	1	...	...	...	...	...
E. ....	2	G	23	1918	...	1	...	...	...	...	...
		S	1	No	...	...	...	...	...	1	...
		F	38	1919	...	1	...	...	...	...	...
		M	35	No	...	...	...	...	1	...	...
		S	12	1919	...	...	1	...	...	...	...

<sup>1</sup>F, father; M, mother; S, son; D, daughter; G, guest; Ser., servant.

CHART 4 (Continued)  
 NON-MILITARY CIVILIANS NOT RESIDING AT FORT McPHERSON (Continued)

Name of family	Quarts milk daily.	Individuals in family. <sup>1</sup>	Age.	Date last typhoid inoculation.	Total typhoid cases.	inoculated			Not Inoculated		
						Adults	Children to 12 yrs. incl.	Ty. cases	Adults	Children to 12 yrs. incl.	Ty. cases.
H	2	F	50	No					1		
		M	45	No					1		
		S	26	No					1		
		S	20	1920		1					
L. F	2	F	30	No					1		
		M	29	No					1		
		S	5	No						1	
		D	4	No						1	
L	2	Ser	32	No					1		
		F	39	No					1		
		M	36	No					1		
		G	45	No					1		
		D	12	No	1					1	1
		D	10	No						1	
		Ser	26	No					1		
		F	28	No					1		
M.	1	M	26	No					1		
		Ser	20	No					1		
M	1½	F	34	1919		1					
		M	32	No					1		
N	1½	D	2	No						1	
		F	58	No					1		
R...	1	M	55	No					1		
		F	46	1919		1					
S	1½	M	42	1917		1					
		F	28	1917		1					
W...	1	M	24	No					1		
		S	1½	No	1					1	1
		F	36	No					1		
		M	30	No					1		
W.	2	G	20	No					1		
		S	6	No						1	
		D	4	No						1	
		F	26	1918		1					
		M	25	1918		1					
		G	24	1918		1					
		G	20	1918		1					
		G	18	1918		1					
		S	2	No						1	
Total non-military	281½	...			2	18	3	0	26	14	2
Grand total.	60	...			9	66	10	1	47	37	8

<sup>1</sup> F, father; M, mother; S, son; D, daughter; G, guest; Ser, servant.

Chart 4 shows the following:

		<i>Typhoid cases</i>	<i>Incidence per 1,000</i>
Total inoculated within 3 years.....	65	0	0 0
Total inoculated .....	76	1	13 1
Total non-inoculated .....	84	8	95 2
Non-inoculated adults .....	47	2	42 5
Non-inoculated children .....	37	6	162 1

#### DISCUSSION

In the bacteriological examination of water samples, if *B. coli* is found the water is at once considered suspicious or decidedly unsafe. It would be a great value if the routine bacteriological examination of milk included a similar criterion of unsafe milk. *B. coli* is so constantly present in what is considered satisfactory milk that no suspicion can be attached to its presence therein. Rosenau, 1917, page 571, states that the number of bacteria in milk is the best single index we have of its general sanitary character. High bacterial counts indicate old milk, frequent handling, or contamination between producer and consumer.

This laboratory over a period of months examined two separate milk supplies; the safe pasteurized milk usually contained twice as many bacteria as did the unsafe unpasteurized supply which was actually liable to harbor *E. typhosus* for a period of about three months.

Probably due to the return to civilian life of many war soldiers an agreeably high proportion of non-military civilians studied herein was found to be protected by the typhoid inoculation. Among 99 civilians living on the post, 55 per cent were inoculated; whereas among 61 civilians not living on the post only 34 per cent had received the inoculation. Although 55 per cent of the civilians living on the post were found to be inoculated, it is believed that compulsory inoculation would be advantageous, in view of the close association with the military and the danger of infection by contact or carrier.

Among 76 individuals protected by the typhoid inoculation there was only one case of typhoid fever, whereas among 84 individuals not protected there were 8 cases. Both groups were living under fairly identical conditions and exposed to an equal possibility of infection.

#### CONCLUSIONS

The sanitary control of the dairy and its surroundings, as well as the medical inspection of the workers therein and their families, is probably of greater value than are routine bacteriological analyses in the prevention of the spread of such diseases as tuberculosis, dysentery, typhoid, diphtheria, scarlet fever, and septic sore throat.

The duties of post sanitary officers should include measures to pro-

fect, by typhoid inoculation, as many as possible of the civilians living on the post.

This epidemic shows conclusively the great value of the typhoid inoculation, especially in cases where the inoculation has been administered within three years.



# THE THEORY OF DISINFECTION

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THE following facts regarding disinfection were gathered a few years ago in connection with a study of the disinfectant action of ultra violet rays. They have been expanded somewhat and are herewith presented in the hope that they may prove of general interest. While the study of disinfection has played an increasingly important part in the science of sanitation, only of late years has the theory of the process received much extended study. Now that the vast mass of data regarding disinfection is slowly being collected and coordinated, certain fundamental and basic facts are becoming more apparent. And it is to the extension of our knowledge of the theory of disinfection, perhaps, that we will make our greatest advance in its practical application. For empirical knowledge, however valuable, is usually the result of much diffuse experimentation and in the end accomplishes far less than rational, discriminating study.

## DISINFECTANTS AND ANTISEPTICS

At the outset it may be as well to draw a distinction between the terms "disinfectant" and "antiseptic." While the latter is a substance which prevents animal or vegetable substances from undergoing bacterial decomposition, a disinfectant is a substance which is able to kill germs which act injuriously on higher forms of life and, in its most efficient form, destroys the spores of pathogenic organisms, which are as a rule more resistant than the germs from which they are formed. Some disinfectants have the valuable characteristic also of destroying the noxious odor which accompanies decay, but this latter property is more clearly the function of a deodorant. The ideal disinfectant would be a substance or means by which deodorizing would accompany the complete destruction of all spores and germs without having any marked action upon higher forms of life. Although many claims have been made, needless to say this ideal disinfectant has never been found.

The death of these minute organisms—bacteria—is not easily brought about in all cases by the same chemical means, because bacteria differ greatly in their resistance. The reason for this is more apparent when we reflect that in an emulsion of bacteria we do not have particles of an homogeneous chemical nature dispersed in the medium, as in, say, a colloidal suspension of arsenious sulphide. Instead, such an emulsion contains bodies composed of a chitin envelope containing

protoplasm—a mixture of proteins, each of which has a very complex nature—peptids, lipoids, carbohydrates, enzymes and mineral salts. The amount of fat in some bacteria is surprisingly high, particularly that in the acid fast bacteria. In the *tubercle bacterium* 26 to 39.29 per cent of the total solids is fat. These facts, particularly such variants as high fat content, should be taken into account as far as possible in the selection of a suitable disinfectant for a given purpose.

#### DISINFECTANTS HAVE SPECIFIC PROPERTIES

In this connection it may be well to point out that no one disinfectant will serve the purpose of destroying all germs to the same extent. In general we think of a disinfectant as doing this, but, as a matter of fact, disinfectants are more or less specific for certain groups or types of organisms. The best disinfectant for a certain type of bacteria is not necessarily good for another. Thus, Bechhold (1) found that by substituting successive bromine atoms in an organic disinfectant for *staphylococci* and *streptococci*, a maximum disinfectant action is reached at three or four bromine atoms; for *B. coli* at two bromine atoms, the disinfectant action falling rapidly in the latter case with the substitution of more bromine atoms. For *paratyphus* the substitution of bromine has no effect, whereas for *diphtheria* the maximum effect is reached on the substitution of three bromine atoms.

Further experiments by Bechhold (2) have shown that while the disinfectant properties of one substance for a certain germ may exceed those of another, this activity may be reversed in the case of a different micro-organism. This interesting point is demonstrated in the following comparison, in which he showed that the minimum lethal dose in twenty-four hours is:

	<i>Diphtheria bacilli</i>	<i>B. coli</i>
For lysol (the cresol content being compared)	1: 20,000	1: 800
For $\beta$ -naphthol.....	1: 10,000	1: 8,000

It is apparent from this that lysol acts twice as powerfully against *diphtheria bacilli* as does  $\beta$ -naphthol, whereas it has only one-tenth the effect of the latter on *B. coli*. He further showed that a mixture of tri- and tetrabrom- $\beta$ -naphthol in 1 per cent solution destroyed *staphylococci* in from two to three minutes, whereas lysol solutions containing 1 per cent cresol required more than ten minutes to do so. Conversely, a 5 per cent lysol solution containing  $2\frac{1}{2}$  per cent cresol is lethal for *tubercle bacilli* within four and a half hours, whereas a solution of tri- and tetrabrom- $\beta$ -naphthol of corresponding strength had no effect even at the end of twenty-four hours. This shows, therefore, that



tri- and tetrabrom- $\beta$ -naphthol surpass cresol in its action on *staphylococci*, while upon *tubercle bacilli* the cresol acts more powerfully.

Various causes have been suggested—and in a few cases experimentally verified—to account for this specificity. While the results obtained are convincing, this question has not been fully answered and much yet remains to be investigated.

#### THE RATE OF BACTERIAL DESTRUCTION

The rate at which bacteria are destroyed by disinfectants has some resemblance to the law of mass action which Wilhelmly so clearly enunciated in 1850. This rule, briefly stated, is as follows: "The amount of chemical change in a given time is directly proportional to the quantity of reacting substance present in the system." Since the rate of bacterial destruction has many points of interest both from theoretical and practical points of view, it may prove of interest to trace its analogy to certain chemical reactions.

If, in a given chemical reaction of the so-called mono-molecular type (for example, the decomposition of hydrogen iodide in light, the inversion of cane sugar, or the transformation of radium by the loss of  $\alpha$ -particles into niton, or radium emanation) we denote by  $C$  the concentration of the substance at the time  $\theta$  and by  $dC$  the change in concentration produced during an exceedingly small interval of time  $d\theta$ , the law that the velocity of a reaction is proportional to the concentration of reacting substance takes the form, in its mathematical dress,

$$-\frac{dc}{d\theta} = kC$$

in which  $-\frac{dc}{d\theta}$  represents the *rate* at which the substance is transformed.

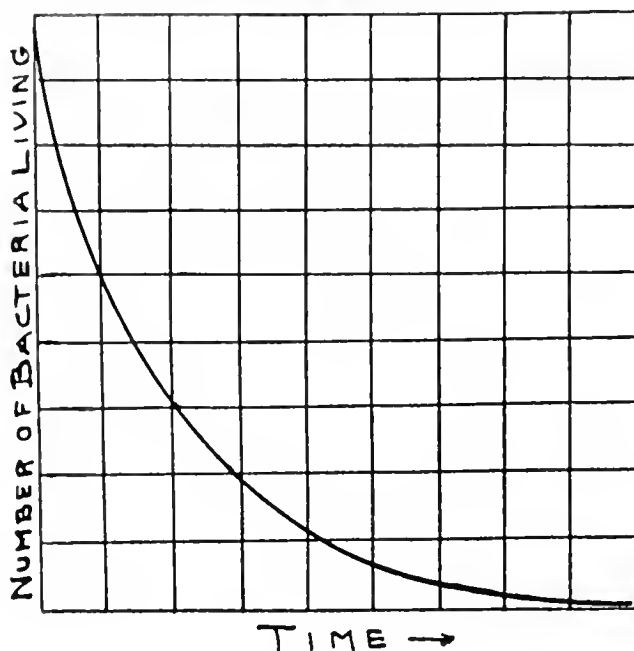
The sign is negative because the concentration of  $C$  is continually decreasing while the time increases. The meaning of the constant  $k$  becomes clear if  $C$  is put equal to 1, for  $k$  then represents the velocity of reaction for unit concentration. It should be remembered that in this expression a constant temperature is assumed. In general the rate of a given chemical reaction is doubled for each rise in temperature of  $10^\circ$ .

The above expression, when applied to the rate of destruction of bacteria by disinfectants, may be expressed in a more usable form as follows:

$$K = \frac{1}{t} 2.303 \log \frac{N}{N-n},$$

where  $N$  denotes the initial number of bacteria,  $n$  the number killed after the disinfectant has acted for  $t$  minutes, and  $K$  is the velocity

constant. The equation in the latter form may be readily applied to experimental data and when plotted takes the form:



It will be found that a great deal of the data we have regarding the rate of disinfection may be inserted in the above expression and the velocity constants computed with a fair degree of success. The rate of bacterial destruction has been measured in this manner by a number of investigators (3-9). As an illustration of the method of procedure, Paul, Birstein and Reuss selected garnets of from 2.4 mm. to 2.6 mm. in diameter, which, after having been shaken in a suspension of *staphylococci*, were drained, dried and kept at a temperature of  $-80^{\circ}$  by means of a mixture of solid carbon dioxide and ether. The organisms preserved in this way maintained their resistance unchanged for weeks and were available for a long series of experiments. In each experiment six garnets were submitted to the desired condition, then shaken with 3 c.c. of distilled water. The latter was then mixed with agar, poured into Petri dishes, and the colonies counted in the usual way. When the dry *staphylococci* were exposed to oxygen, it was found that their destruction followed the equation for a monomolecular reaction and that the velocity constants were approximately proportional to the square root of the oxygen concentration. They found that the temperature coefficient for velocity of disinfection lies between two and three but that the coefficient is not constant, becoming less

as the temperature increases from 18° to 37°. This decrease may be due to the influence of adsorption during disinfection.

Applying somewhat similar experiments in determining the disinfectant action of various acids, the above investigators made the interesting discovery that the disinfectant action of acetic and of butyric acid is much stronger than that of hydrochloric acid in isohydric solution, i. e., solutions containing the same number of hydrogen ions. They further found that some mineral salts, in concentrations in which they themselves have no disinfecting action, increase the disinfectant activity of mineral salts with the same or different anions.

The following two tables taken from the recent article of Lee and Gilbert (10) show very good agreement in the value of  $K$ , the constant for the rate of death of the bacteria.

#### DISINFECTION OF *B. TYPHOSIS* WITH PHENOL

Concentration of Disinfectant = 0.2 per cent.      Temperature = 37.5°

Time in minutes = $t$	Mean number of microorganisms surviving = $N$	Log. of concentration = $\log_{10} N$	$K = \frac{1}{t_n - t_o} \log \frac{N_o}{N_n}$
Control = $t_o$	20,400 = $N_o$	4.30	.....
2	18,000	4.25	.....
4	11,600	4.06	0.060
6	8,000	3.90	0.067
8	6,400	3.80	0.062
10	5,200	3.71	0.059
15	2,800	3.44	0.057
20	1,500	3.17	0.057
25	750	2.87	0.053
30	400	2.60	0.057
35	250	2.39	0.055
40	120	2.07	0.056
45	64	1.80	0.056

#### DISINFECTION OF ANTHRAX SPORES WITH MERCURIC CHLORIDE

Time in minutes = $t$	Mean number of microorganisms surviving = $N$	Log. of concentration = $\log_{10} N$	$K = \frac{1}{t_n - t_o} \log \frac{N_o}{N_n}$
Control = $t_o$	15,500 = $N_o$	4.19	.....
5	7,200	3.85	.....
10	4,100	3.61	0.057
15	2,200	3.34	0.056
20	1,500	3.17	0.050
25	925	2.96	0.049
30	700	2.84	0.045
40	250	2.39	0.045
50	80	1.90	0.045
60	41	1.61	0.043

With respect to any such measurements, it must be remembered that there are several factors that must be taken into account, and it is not at all certain that our knowledge of certain disturbing influences is complete. Estimating the rate of bacterial destruction is very likely not so simple a thing as measuring the rate of transformation of a pure chemical compound. Indeed, from some quarters vigorous criticism has been leveled at this application of the mass action theory to the case of bacterial destruction by disinfectants. According to Brooks (11) "The acceptance of such an explanation makes it necessary to assume that loss of viability, like the breaking up of a single molecule of saccharose during inversion, takes place in a single step. In other words, that the disinfectant cannot have any cumulative effect on the viability of the cells. If the loss of viability occurred in two or more steps, some or all of the cells surviving at any time during the process would be 'partially dead' and a greater proportion of them would succumb in any given interval of time than would have done so during the same interval at the beginning of the process when all the cells were entirely unaffected. In other words, the per cent of deaths would decrease during the process instead of remaining constant as demanded by the law of monomolecular reactions."

The study of disinfection carried out from the kinetic viewpoint has much in its favor, however, since it affords us a means of comparing two disinfectants much more directly than the hit-and-miss method usually employed. The comparison of activity of various disinfectants with the same or different types of bacteria, where the study is carried out under more or less exacting conditions, is very likely to afford us a clearer insight into the phenomena—adsorption, etc.—which come into play during the process of destruction of the living germ.

#### WHAT OCCURS DURING DISINFECTION

It may be well at this point to examine into the process of disinfection itself. What occurs when a disinfectant acts on living bacteria? Years ago it was assumed that the death of the microorganism was wholly due to a toxicity of the disinfectant, but this is not wholly true, for many substances—charcoal and certain dyes known to be non-toxic—have disinfectant properties.

One of the basic facts in disinfection by means of chemicals is that a certain *distribution* occurs between the organism and the disinfecting substance. This distribution may be either the result of adsorption or of direct chemical combination. The importance of surface attraction in bacteria is readily apparent from the ease with which they are stained. In fact the only point of distinction involved between disinfection and staining is that the former involves killing the organism.

If we consider an emulsion of bacteria as a suspension of small particles without special chemical properties, and add to this suspension a dissolved substance, this substance would by reason of the mere surface attraction have a tendency to concentrate on the surface of the bacteria to an extent determined by the nature of the dissolved substance. In general, the more effectively the given substance diminishes the surface tension of the water, the greater is its concentration on the surface (12). Similarly, microorganisms themselves are readily adsorbed by other substances with great surface development. It is to this property that we are indebted for the fact that bacteria may be held back, or adsorbed, by unglazed porcelain or charcoal filters.

#### ADSORPTION

It is thus apparent that adsorption plays a part of considerable importance in disinfection. The adsorptive capacity of a bacterial emulsion is not very remarkable when we reflect what an enormous development of surface the bacteria collectively represent. If the assumption is correct that adsorption is essential to disinfection, then the medium in which the disinfectant acts must be of enormous importance—that is, the same substance would be a much better disinfectant in water than in, say, alcohol. Experiments which Koch made years ago with *anthrax spores* bear this out. Koch found that *anthrax spores* were not killed by exposure to 5 per cent phenol in oil for 100 days, nor in 5 per cent alcoholic solution of phenol for 70 days, whereas they were destroyed by 48 hours' exposure to 5 per cent aqueous solution of phenol. *Anthrax bacilli* were of undiminished virulence after 2 days' exposure to 5 per cent phenol in oil, while 1 per cent solution in water killed them in two minutes.

It is evident that emulsified bacteria constitute the disturbing factor in the equilibrium between water and the disinfecting substance and that the capacity for adsorption may enter more largely into disinfection than the solubility of the disinfectant itself. Thus, Paul and Krönig (13) found that sodium phenolate, which is strongly dissociated and much more soluble than phenol, is a much weaker disinfectant than the latter.

Cresol, which is less soluble than phenol, is a more powerful disinfectant than the latter. The solubility of cresol is such that it may only be used as an emulsion with the aid of soaps, etc. Frei and Margadant (14) found in this connection that electrolytes increase the disinfectant action of cresol soap solutions—some indeed to a very marked degree. According to Frei (15) the electrolytes which are added have an action upon the disinfecting agent as well as upon the medium and

the bacteria. The principal action of the electrolyte upon the medium is a decrease in the solubility of cresol in it, by means of which the cresol is driven into that phase in which it is most soluble—namely, the bacteria. Thus it increases the concentration of the poison in the cells upon which it is to act. At the same time the ions are also taken up by the bacteria, but this probably does not change their capacity for taking up cresol. The anion seems to have a sensitizing action upon the cell, as may be demonstrated by previously treating the bacteria with electrolytes.

It will be recalled that the halogens and many salts of the heavy metals, such as copper, mercury, silver and even lead, have marked disinfecting properties. These substances, mercuric salts in particular, are readily adsorbed from solution by proteins, etc.

Adsorption experiments have been made by Herzog and Betzel (16) in which pressed yeast was shaken with solutions of different concentrations of chloroform, silver nitrate, mercuric chloride, formaldehyde and phenol. After a given time each mixture was centrifuged, and in the solution the amount of disinfectant not adsorbed was determined. With chloroform, silver nitrate and mercuric chloride, the partition of the disinfectant between the cells and solution agreed very well with the well-known adsorption formula:  $\log c = \log K + n \log b$ . The results with phenol and formaldehyde were not so clear cut, however. With phenol they obtained adsorption curves only for concentrations below 1 per cent, while with formaldehyde, which is well known to have a powerful inhibitive action on growth, the adsorption formula was not followed at all.

Many other cases might be cited in which adsorption has been shown to play a part in disinfection. Recently Traube (17) has shown that there is a definite parallelism between the disinfectant action of the hydrocupreines upon several bacilli and cocci and the surface activity of the microorganism.

#### ADSORPTION IS ONLY ONE PHASE OF DISINFECTION

The many facts that have been brought to light by the application of the adsorption theory, however, indicate that adsorption is only the first phase of disinfection. It is only a condition preliminary to the specific toxic action of the disinfectant. Further than this, through lack of direct evidence, our ideas are somewhat hazy. It is generally assumed that this toxic activity, in the case of the heavy metals at least, is connected with the formation of protein compounds with the metal. In this connection it has been shown that *anthrax spores* treated with mercuric chloride and apparently killed could be reactivated by treatment with hydrogen sulphide. By this means the soluble mercuric

chloride is converted into insoluble mercuric sulphide and a growth of *anthrax bacilli* can be obtained.

The part that adsorption plays in disinfection is somewhat difficult to ascertain, but it is quite likely that as a result of adsorption the germ is surrounded by a film of disinfectant—highly concentrated and perhaps much more active than in the dilute solution.

Other factors which enter into the process of disinfection are the specific nature of the poison and the reaction of the germs to this poison. Thus, mercuric acetate is more strongly adsorbed than mercuric chloride (18), yet its disinfecting action is less than that of the chloride (Bechhold). In this case, since mercuric chloride is more highly ionized than mercuric acetate, the concentration of the mercuric ion is a necessary condition in disinfection. Mercuric cyanide, which is but little ionized, has only a weak destructive action on bacteria.

Krönig and Paul (19) found that the germicidal activity of mercuric chloride was much depressed by the addition of sodium chloride. In this case a complex salt ( $\text{NaHgCl}_3$ ) is formed in which mercury occurs in the anion. For this reason, pharmaceutical tablets of mercuric chloride containing sodium chloride (which is added to increase the solubility of the mercuric salt) are much less active than mercuric chloride alone.

It may be added that it is relatively easy to be lulled into a false sense of security by the use of odoriferous disinfectants. Thus chlorine, which in many cases is an excellent disinfectant, was shown by Sternberg (20) as early as 1881 to have but little effect on certain infusoria and micro-organisms.

#### HYDROGEN ION CONCENTRATION AND PERMEABILITY

As Friedenthal (21) has pointed out, there is no single ion of such antiseptic virtue as the hydrogen ion, of which one gram is computed to be capable of maintaining sterility in 30,000,000 liters of culture media. Anbel (22) has sought to find the relationship between toxicity of acids towards bacteria and their concentration of hydrogen ions. According to this investigator, the acids examined fall into four groups: (1) formic and acetic, (2) oxalic, tartaric and lactic, (3) sulphuric, and (4) phosphoric, hydrochloric and nitric. Groups (1) and (2) are most toxic, (3) is intermediate, while nitric and hydrochloric have the least effect. These conclusions are quite in agreement with the results obtained by Paul, Birstein and Reuss (23) in the case of acetic, butyric and hydrochloric acids.

In order to reconcile the two facts that the hydrogen ion has marked disinfectant properties and that, of the two acids hydrochloric and

acetic in isohydric solution, acetic acid is the better disinfectant, we must look for something more than the mere toxicity of the hydrogen ion. Two explanations are apparent: (1) that mineral acids may have a coagulating effect on the capsule, which would tend to form an insoluble layer, protecting the cell from any further effect, or (2) the organic acids being lipoid-soluble, would more readily penetrate the cell wall in the molecular condition and furnish sufficient hydrogen ions within the cell to exert a lethal effect.

The cell penetrating ability of a number of acids has been investigated by Crozier (24), who was able to follow the penetration of the acid into the cell by means of the color change produced by the intracellular indicator of the *chromodoris zebra*. According to this investigator the degree of penetration depends largely upon the union of the acid with one of the several constituents of the cell surface. In the case of the weak monobasic fatty acids, this constituent is of a fatty nature. Of the organic acids studied, this penetrating power was in the order of the solubilities of these acids in olive oil or in xylol. These facts are of significance in showing why certain substances, which have disinfectant properties towards one class of bacteria, are more or less inactive towards other bacteria.

A study of the literature of disinfection brings one to the conclusion that our greatest progress in this field will lie in the direction of refined, quantitative measurements. Future work will probably be characterized by the development of substances having specific disinfectant properties. The fact that bacteria sometimes acquire an immunity towards a given disinfectant (25, 26) may perhaps be met by developing a substance having certain disinfectant properties, which in solution will undergo isomeric change or slowly decompose into a substance having different disinfectant properties. In this way, bacteria which could successfully withstand the action of one disinfectant would be subjected to the action of a second—wholly different in nature and increasing in concentration as the former diminished.

In this brief article the attempt has been made to summarize some of the important work that has contributed to our knowledge of disinfection, and, while it is necessarily somewhat sketchy, it is trusted that it will present certain aspects of the subject to those who have not the leisure systematically to read the scattered literature of a very important subject.

#### REFERENCES

- (1) Bechhold, H., Zeitschr. Chem. Ind. Kolloide, 5, 22.
- (2) Bechhold, H., Zeitschr. f. Hygiene u. Infektionskrankh., 64, 113 (1909).
- (3) Madsen, T., and Nyman, M., Zeitschr. Hyg., 57, 388 (1907).



- (4) Chick, H., Jour. Hyg., 8, 92 (1908); 10, 237 (1910).
- (5) Paul, T., Birstein, G., and Reuss, A., Biochem. Zeitschr., 25, 367 (1910),  
29, 202 (1910); 29, 249 (1910).
- (6) Phelps, E. D., Jour. Infect. Dis., 8, 27 (1911).
- (7) Reichenbach, H., Zeitschr. Hyg., 69, 171 (1911).
- (8) Eijkman, C., Folia Microbiol., 1, 359 (1912).
- (9) Lee, R. E., and Gilbert, C. A., Jour. Phys. Chem., 22, 348 (1918).
- (10) *Loc. cit.*, pp. 360-361.
- (11) Brooks, S. C., Jour. of Gen. Physiol., 1, 61 (1918).
- (12) Bechhold, H., Int. Cong. Appl. Chem., 1909.
- (13) Paul and Krönig, Zeitschr. physik. Chem., 21, 446.
- (14) Frei, W., and Margadant, C., Zeitschr. Infektionsk. Haustiere, 15, 273; 350.
- (15) Frei, W., Zeitschr. Infektionsk. Haustiere, 15, 407.
- (16) Herzog, R. O., and Betzel, R., Zeitschr. physiol. Chem., 67, 309; 74, 221.
- (17) Traube, I., Biochem. Zeitschr., 98, 177; 98, 197 (1919); Immunität, 286  
(1920).
- (18) Schellens, W., Inaug. Dissert. (Strassburg, 1905).
- (19) Krönig and Paul, Zeitschr. physik. Chem., 21, 419; Zeitschr. Hyg., 25, 1.
- (20) Sternberg, G. M., Bull. National Board of Health, Wash., July 23, 1881.
- (21) Friedenthal, H., Biochem. Zeitschr., 94, 47 (1919).
- (22) Aubel, E., Compt. rend., 170, 970 (1920).
- (23) *Loc. cit.*
- (24) Crozier, W. J., Jour. Biol. Chem., 26, 228 (1916).
- (25) Richet, C. and Cardot, H., Compt. rend., 168, 657 (1919).
- (26) Cardot, H. and Richet, C., Ann. Inst. Pasteur, 33, 575 (1919).



# REPORT OF AN OUTBREAK OF TYPHOID FEVER AT JACOBSTOWN, N. J., AUGUST, 1921

By MAJOR S. JAY TURNBULL  
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AN OUTBREAK of typhoid fever occurred during the first week of August, 1921, at Jacobstown, N. J. The occurrence of the first case was on August 4. A number of cases developed shortly thereafter, and the peak of the epidemic was reached on August 12, to be followed by a rapid decline in the case incidence.

Prior to the epidemic, typhoid fever had been practically absent from the community, and this fact together with the sudden onset accompanied by clinical symptoms resembling those of "food poisoning," occasioned some confusion in regard to the character of the infection and delayed its recognition. The nature of the disease was definitely determined by the isolation of *B. typhosus* from the urine and feces of 30 cases, and further presumptive evidence was furnished by the demonstration of a positive Widal reaction in the blood of 70 of the cases. In view of the similarity of the clinical symptoms, the epidemic character of the infection, and the fact that other febrile diseases were not prevalent in the community at the time, it is believed that positive laboratory findings were obtained in a sufficient number of instances to justify the conclusion that practically all of the cases were typhoid fever.

## EPIDEMIOLOGY

The town of Jacobstown, with a population of about 146, is located in an essentially rural district devoted entirely to agriculture. The village has neither public water supply nor municipal sewerage system. It is the practice for each family to obtain its water supply from wells or rainwater cisterns, and to dispose of excreta by means of privies.

No dairy milk is used in this community, the supply for the inhabitants being obtained either from a cow owned by the family or by purchase from the neighbors.

A Harvest Home supper was given on July 27, 1921, and the cases of typhoid fever which occurred during the epidemic were confined to the group of individuals who ate food served at that function. Approximately 400 people were either present in person or consumed some of the food used at the supper. With the exception of a few who came from a considerable distance, these people were residents of Jacobstown and the surrounding country. Of the 400 individuals, 199, representing 121 families, subsequently contracted typhoid fever. Further evidence indicating that the supper was the primary source of the infection is

furnished by the fact that the disease occurred among those who did not live in the vicinity and were in the town only during the time of the supper, and also among a group of persons who did not actually attend the supper but ate some of the food which was carried to their homes.

The food served at the supper was prepared by a committee composed of twenty-six women and two men. The menu consisted of cold boiled chicken, chicken salad, mashed potatoes, cottage cheese, sliced tomatoes, cole slaw, apple sauce, cold sliced veal, cold boiled ham, rolls and butter, iced tea, coffee, stewed corn, sliced peaches and milk, ice cream and cake.

On July 26 the chickens were taken to the chapel where the supper was to be served, killed, dressed and boiled in four separate lots. Large furnace kettles were used for cooking the fowls. After boiling they were removed from the kettles, placed in a galvanized iron container, and covered with cloths. The cooking was completed by about 5 p. m. About two hours later the chickens were carved; the breasts, upper joints and legs were served as cold meat, while the remainder was cut into small pieces for salad. This meat as cut, and while still warm, was tightly packed into large agate-ware dish pans which were placed in an improvised ice-box, where they were allowed to remain until 4 p. m. the next day. After removal from the ice-box the chopped meat was mixed with celery and salad dressing and served at the supper, which took place at about 5 p. m. on July 27.

The work of preparing the chicken salad was performed by ten women and one man. The man and seven of the ten women developed typhoid fever. Of the remaining three women, one showed no clinical symptoms of the disease, and no typhoid bacilli were found in the stools or the urine. The other two presented no clinical signs, but the stools of both were positive for *B. typhosus*. The history of one of these women showed that about eight years ago she had nursed a case of typhoid fever. The other woman denied that she assisted with the preparation of the salad but admitted that she was present at the time and had tasted it.

An epidemiological study, largely by the process of elimination, indicated that in all probability the chicken salad provided an avenue of transmission for the infective agent. On investigation it was found that of the 199 cases only 10 individuals denied eating the salad. One of these carried a jar of the salad home, where it was eaten by other members of the family, among whom one case developed. In another case the patient was ill two days prior to the day of the supper, and in this instance the father was a known carrier and it is probable that the disease was contracted from the parent. Four others did not eat any

of the salad but ate some of the cold chicken. One ate supper but did not eat any of the salad. Two denied eating any of the food served at the supper, but these cases gave negative Widal's and negative stools, although they were reported as typhoid fever.

Thirteen persons who did not attend the supper subsequently contracted typhoid fever, but on investigation it was found that they had in each instance eaten some of the chicken salad brought home to them by friends, and had not consumed any other article of food served at the supper.

Of the 199 cases, 73 did not drink water at the supper and 86 consumed no milk. On the other hand, one group of 16 persons took only water and ice cream, and none of these developed typhoid fever.

Forty-eight of the cases occurred in individuals from 45 to 80 years of age. There were 15 deaths, a case mortality rate of 7.5 per cent.

It was impossible to determine how many of the cases had been protected by anti-typhoid vaccination. One case was known to have been immunized against the disease, and in this instance the attack was mild.

Jacobstown is located at a distance of 6 miles from Camp Dix, N. J. The town is without hospital facilities and, as the limited number of physicians practicing in the vicinity were physically unable to cope with the large number of cases, the Township of Jacobstown and the State Board of Health requested that assistance be rendered by the military authorities at Camp Dix. This request was granted and the required personnel and equipment placed at their disposal by the camp surgeon. The most urgent necessity was nursing and hospitalization of the sick. There being no nurses available for this duty at the camp, the chief nurse of the Station Hospital was successful in obtaining a sufficient number from nearby cities. Equipment for a thirty-bed hospital was sent to Jacobstown by trucks, together with sufficient personnel to assist in its establishment. The services of medical officers were made available both for the purpose of administering anti-typhoid vaccine and for the care of the sick. The laboratory of the Station Hospital, Camp Dix, was utilized in the performance of the necessary technical procedures.

The emergency hospital was established in the chapel at Jacobstown, and it is believed that this measure was responsible for the prevention of a considerable number of fatalities. The people of the community have expressed their appreciation in no uncertain terms, and the assistance rendered by the Army has been a factor in the maintenance of the cordial relations which exist between the military and civilian populations.

The close proximity of this town to the camp, and the fact that of the first cases a number occurred among the workers in a dairy furnishing

milk to the camp, necessitated the immediate initiation of measures to protect the command. The service records of all enlisted men were examined to determine their protection, and all civilians, including the families of officers and enlisted men, were urged to take the anti-typhoid inoculation. The milk supply was limited to that of the two dairies for the reason that better supervision could be maintained and, furthermore, they were located out of the infected zone. The urine and stools of their personnel were examined for the typhoid bacillus with negative results, and they were all given anti-typhoid vaccine. Daily bacteriological examinations were made of the milk supply, special attention being directed to the typhoid-colon group. Also a daily laboratory examination was made of the water supply. The town of Jacobstown and vicinity was placed "out of bounds" for the military personnel. No cases of typhoid fever developed among the members of the command at Camp Dix.



# STUDY OF 2,400 CASES PRESENTING CARDIO-VASCULAR SYMPTOMS, ACCEPTED FOR MILITARY SERVICE

BY LIEUT. COLONEL ROGER BROOKE

*Medical Corps, United States Army*

WHILE Col. L. A. Conner was chief of the Division of Medicine, in the Office of the Surgeon General of the Army, he collected 2,400 cards filled in at mobilization camps by cardio-vascular examiners. These cards contained the findings noted mostly by experienced examiners in the above-mentioned number of men, presenting cardio-vascular symptoms, accepted for service. Presumably the vast majority of the number had only functional disorders. The above group by no means includes all men accepted for service with functional or organic cardio-vascular disturbances.

The work was undertaken with a view of comparing the discharge rate and such other statistics as might seem pertinent of this group with the Army at large. We hoped the end results would add to our knowledge of functional cardio-vascular disorders and possibly permit more specific and dogmatic stands to be taken with reference to physical requirements for acceptance for military service and life insurance than previous experience and learning appeared to justify. It is the purpose of this paper to show to what length our expectations have been realized.

## STATISTICAL TABLE

Average period of service—20 months for cases studied

Hypertension and sinus arrhythmia	127	
Arrhythmia, extrasystoles	265	
Tachycardia	607	
	<hr/>	999
Murmurs; apex systolic functional	459	
Noted as mitral regurgitation without hypertrophy	687	
Murmurs, findings insufficient to classify, most of which were noted as mitral regurgitation without further remarks	190	
Murmurs, probably of organic origin	65	
	<hr/>	1,401
		<hr/>
		2,400
		<hr/>

Of the 1,401 cases with murmur, 214 were associated with arrhythmia, hypertension or tachycardia, mostly the last

Functional murmur cases discharged with diagnosis of valvular lesions	•	
—459	2	2.61
Mitral regurgitation without hypertrophy discharged with diagnosis of valvular lesions—687	7	6.11

\* Rate per 1,000 per year.

Unclassified murmurs discharged with diagnosis of valvular lesions—190	18	57.00
Murmurs, probably organic, discharged with diagnosis of valvular lesions—65	9	83.00
	<hr/>	36
Cases with tachycardia discharged on C. D. on account of valvular lesions—607	5	4.94
Cases with tachycardia discharged on C. D. on account of effort syndrome or irritable heart—607	6	5.92
Cases with tachycardia discharged on C. D. on account of hyperthyroidism—607	8	7.90
	<hr/>	19
Cases with extrasystoles discharged on C. D. on account of myocarditis—265	4	
Cases with extrasystoles discharged on C. D. on account of mitral regurgitation—265	1	
	<hr/>	5 11.3
Discharged on C. D. on account of cardio-vascular disorders	<hr/>	60
Admitted to sick report and returned to duty on account of valvular lesions—2,400	23	5.75
Admitted to sick report and returned to duty on account of functional murmurs—1,146	12	6.28
Admitted to sick report and returned to duty on account of myocarditis—2,400	7	
Admitted to sick report and returned to duty on account of functional disorders—2,400	32	8.00
	<hr/>	
Admitted to sick report and returned to duty—2,400	62	
Discharge rate for the Army at large per 1,000 per year due to valvular heart lesions		2.66
Admission rate for the Army at large per 1,000 per year due to valvular lesions		4.52
Admissions for the Army at large per 1,000 per year due to functional cardio-vascular disorders		3.08

The time factor involved (twenty months) and number of cases (2,400) make the drawing of conclusions difficult and fraught with some danger. On the other hand, the identity of the conditions under which the men lived and the well-recognized tendency of the stress of active military service to make manifest latent cardio-vascular diseases, to a material degree, offset the short-comings.

Never before in the history of medicine has the significance of systolic murmurs been so fully discussed and warmly debated as during the World War. For a number of years the profession has accepted the view that some præcordial adventitious sounds, and particularly systolic ones, were of functional, accidental, or even physiologic origin, but there has been scant accord as to the criteria for differentiating the functional from those connoting valvular lesions.

The vast majority of the murmur cases under consideration presented a systolic bruit at the apex; hence what I will have to say with reference to this class will have to do almost wholly with differentiating mitral regurgitation from functional disturbances. The criteria accepted in this series as justifying the establishment of a diagnosis of mitral insufficiency are simple and few in number, namely, an apex systolic murmur associated with enlargement of the heart; or the same type of murmur in an individual giving a history of rheumatism and exhibiting either a poor response to exercise or accentuation of the pulmonary second sound. I disclaim originality as to the need or adequacy of these requirements to warrant a diagnosis of a valvular lesion and do not deny that many others are of value. The data available for analysis, however, perforce limited me to the consideration of few criteria. They are, however, very similar to the criteria emphasized by Conner, Janeway, Lewis, and other authoritative medical men who have done so much toward perfecting our knowledge in this field. As to the significance of lesser finding as the area of maximum intensity, quality and transmission of the bruit, influence of posture and respiratory phase upon it, I will have more to say later on.

In the functional group—459—a number were noted simply as murmur, apex, systolic, functional or accidental. These were accepted at their face value. On some of the cards the findings were so full and complete that "he who runs could read" and a diagnosis was made in accordance with the requirements previously quoted.

In the second group—687—accounted for as "mitral regurgitation without hypertrophy," about one-half were noted as such without further qualifications. In a goodly proportion, however, remarks as to response to exercise, absence of history of rheumatism, quality and transmission of the murmur and absence of accentuation of the pulmonary second were noted and hence they could be rated with a considerable degree of confidence.

I will now ask your attention for a few minutes while I refer briefly to some of the minor findings. In the 1,146 cases comprising the two functional murmur groups, the murmur was transmitted into the axilla in 279, and even to the back in 17. Six of the former and 1 of the latter were discharged on account of valvular heart disease; ratios of 1 to 46 and 1 to 17, respectively. The quality was noted as loud, rough or harsh in approximately 100 murmurs recorded as transmitted to the axilla or back, forcible arguments against attaching much weight to the character and propagation of the bruit. On the other hand, of the 9 cases of the series discharged because of valvular heart disease, in 6 the murmur was noted as transmitted into the axilla and loud or



blowing in four ratios of 1 to 1.5 and 1 to 2.25. Conversely, in 2 of this series and 4 of the unclassified group in which discharge was effected, the murmur was noted as soft and indifferently transmitted; ratios of 1 to 4.5. Truly "judgment is difficult and experience is fallacious" when one is confronted with such confusing statistics. Nevertheless, I venture to express the opinion that, while harshness and transmissibility are frequently properties of organic murmur, these qualities by no means exclude sound of functional origin. Seven cases of the two functional groups came to autopsy; in none, however, was a valvular lesion observed.

Two men of the group rated as functional (159) were discharged on account of mitral regurgitation. One had experienced two attacks of rheumatic fever in the service before the diagnosis was made. The other was discharged after one month's service, no infection or sickness intervening. Obviously, one set of examiners made either false observations or erroneously interpreted the findings in the latter case.

Of the "mitral regurgitation without hypertrophy" series, 7 were discharged because of valvular lesions.

*Case No. I* had two attacks of rheumatic fever in France. The mitral endocarditis was officially noted as a complication of the infection. Service ten months. Comment: a rational diagnosis.

*Case No. II* contracted influenza August 6-18; on September 16 he was again admitted to the hospital with a tentative diagnosis of dermatitis, acute toxic, generalized, which was subsequently changed to miliaria rubra. November 8, a diagnosis of mitral insufficiency was made and set down as having existed prior to enlistment. Service four months. Two explanations are offered. First, he developed an endocarditis as a complication of influenza or dermatitis. Second, he had an irritable heart induced by the infections.

*Case No. III* presented the following sick record: "Oct. 16 18, influenza; Oct. 29, laryngitis, acute; Nov. 10, mitral insufficiency, existed prior to enlistment; Jan. 18-19, tachycardia, simple; endocarditis, acute, both following scarlet fever in 1911; Feb. 14, mumps; Feb. 19, orchitis due to mumps; March 8, discharged on certificate of disability. Cause: tachycardia simple, and endocarditis, acute. Service, four months." In view of a history of influenza followed by tachycardia and disability and the knowledge of a rated functional murmur antedating acceptance for service, a diagnosis of effort syndrome associated with functional murmur appears more logical than mitral regurgitation.

*Case No. IV* had the following findings noted on acceptance for service: "Pulse 104, after exercise 129, two minutes later 100. Systolic

murmur at apex transmitted to axilla. Systolic over aortic area heard in base of neck. No enlargement." Discharged on certificate of disability after five months' service, no sickness intervening, with a diagnosis of mitral stenosis, beginning loss of compensation. Service seventeen months. Comment: Information too meager to warrant definite conclusions. However, the combination of tachycardia and functional murmur may have easily deceived an inexperienced doctor. In foreign armies, as well as in our own, a number of soldiers with functional murmurs plus effort syndrome were discharged with a diagnosis of valvular heart disease.

*Case No. VI.*—Findings on admission to service: "Soft systolic murmur at apex indifferently transmitted to axilla, and angle of scapula. Murmur less evident after one minute of double time. No general evidence of decompensation. Heart not enlarged. Murmur not believed to be organic." Sick and wounded record: "Nov. 19, 1917, mitral insufficiency uncompensated; existed prior to reporting for service; Nov. 23, bronchitis, acute; Dec. 11, discharged on certificate of disability; cause mitral stenosis." Service one month. Comment: Either the examining or disability board made a blunder. Evidence tends to incriminate the latter.

*Case No. VII.*—Findings of examining board: "Blowing systolic murmur at apex transmitted only to anterior axillary line. No hypertrophy. No accentuation of pulmonary second. Murmur disappears on deep inspiration, also in supine position. Response to exercise normal." Sick and wounded record: "Nov. 1-17, myocarditis, chronic, existed prior to enlistment; Dec. 7, observation for heart disease, no organic disease found; Dec. 19, myocarditis, chronic; Jan. 28, organic heart disease, mitral regurgitation, disability existed prior to soldier reporting for military duty." Discharged on certificate of disability; service four months. Comment: The history and findings are more in keeping with a diagnosis of effort syndrome.

*Case No. VIII.*—Findings on acceptance for service. "Heart murmur at apex, transmitted into axilla, no hypertrophy, no accentuation of pulmonary second, no rheumatic history, no symptoms. Diagnosis: Mitral insufficiency without hypertrophy." Sick and wounded record: "Sept. 28-18, valvular heart disease combined lesion, aortic and mitral insufficiency," which, astonishing as it may seem, was boldly put down as caused by being gassed in the Argonne, France. He completed two years of service and was discharged on a certificate of disability in a demobilization camp, having carried on eight months after the diagnosis was made. Comment: No note of Wassermann test having been made at any time, no information as to blood pressure or

character of pulse. In view of his long service and absence of rheumatism or acute infection, I am inclined to believe that he developed an aortic regurgitation in the service. His youth, 24 years, would tend to eliminate lues as a factor. Strain is now acknowledged to rarely, if ever, alone cause an aortic lesion. Eight of the 9 cases from this group were discharged from four camps, datum suggestive of the view that preconceived ideas rather than accurate observation and logical reasoning played an important rôle in influencing the action of the disability boards.

A summary of the histories and findings of the 9 cases just surveyed indicates that 3, and possibly 4, had true valvular disorders and that 5 had irritable hearts or so-called effort syndrome plus functional murmur.

This view is strongly supported by the fact that up to February 1, 1921, only 3 of the 9 cases just considered had made application to the Veterans' Bureau for compensation. The disabilities noted at discharge were confirmed and comprise No. 1 of the functional group and Nos. 1 and 7 of the "no hypertrophy" series. The first 2 had definite attacks of rheumatic fever while in the service. The third case was discharged with a double lesion, but without a history of rheumatism or evidence of valvular trouble upon acceptance for service. My comment, that the disability probably originated in the service, but on account of his youth and present knowledge of the action of strain doubted whether either syphilis or violent effort was a factor, was written before I had consulted the records of the Bureau of War Risk Insurance. His history since separation from the service shows that he had infected tonsils, which have recently been removed, and offer a more plausible explanation than gas as a cause of the lesion. Also two attacks of tonsillitis in the field—soldier's statement. The etiological rôle of rheumatism as a proved cause of valvular heart disease is emphatically emphasized in this series.

As an illustration of the signal value from both an administrative and prognostic point of view of the criteria postulated in the early part of this paper, the following case—there were many similar ones in the series—is cited. Accepted for service with the following notation: "At apex presystolic rumble, thumping first sound, intense systolic blowing murmur transmitted to axilla and back. Rough systolic bruit at pulmonary area, softer at aortic area, pulmonary second not plus. Mitral stenosis, and insufficiency without hypertrophy; accepted for service on account of perfect compensation." At the time of demobilization, after eighteen months' service, this officer was given a careful physical and mental examination and found to be physically and mentally sound.

I do not attach much weight to the admission rate for valvular diseases in the murmur group for the following reasons: All of the cases of necessity had a bruit. The diagnosis was frequently made under trying condition, as in the field, and often by medical officers inexperienced in cardio-vascular work. That these factors were potent in augmenting the admission rate is supported by the discovery that a number were taken up on sick report at one time as valvular disorders, at another time as functional.

The fact that the discharge rate on account of valvular lesions for the group accepted with tachycardia is higher than the two functional groups as 4.94 is to 4.70 is noteworthy and, in my opinion, justifies the conclusion that tachycardia merits as much if not more consideration than murmur. The clinical importance of tachycardia is further emphasized by the revelation that two other disorders masqueraded as, or at least simulated, simple accelerated heart action, to-wit: effort syndrome and hyperthyroidism. To me, the fact of the disguise was not surprising, but the percentage was larger than anticipated. The discharge rate was 5.92 and 7.90, respectively. From the above it would appear that all individuals with tachycardia should be subjected to a searching examination with a view of detecting the three mentioned diseases. If these can be eliminated, the remaining 97 per cent make good military risks.

The extrasystole group showed an unexpectedly high discharge rate, 11.3 per 1,000, of which 9 per 1,000 were due to myocarditis. One man from this series was discharged on account of mitral regurgitation, probably a relative mitral leak due to myocardial insufficiency. There were no other discharges from this class. The discharge figures indicate that 11½ per cent of extrasystoles in young people are due to myocarditis and that, barring this disease, the disorder is inconsequential.

As in the murmur groups, so in the tachycardia and extrasystoles, the Veterans' Bureau discharge records show that our discharge boards misconstrued the symptoms of effort syndrome for those of more serious disorders. Thus of the 5 cases of the tachycardia group discharged with a diagnosis of valvular heart disease, only one has applied for compensation. Of the 8 cases discharged with a diagnosis of hyperthyroidism, only 2 have been rated as such by the bureau. Of the 6 cases discharged as irritable heart, 2 have been allowed compensation for this disorder. Of the 4 cases with extrasystoles discharged as myocarditis, only one has been confirmed as such. These figures, of course, do not prove that all the men discharged with disability and who have not submitted claims did not have the disorders for which they were discharged, but, in my opinion, do justify the conclusion that the major number did not suffer from the graver disturbances.

As might be anticipated, not a case of sinus arrhythmia or hypertension came to discharge. However, the number involved, 81 of the former and 46 of the latter, is too small to justify sweeping deductions.

The old adage that "every rule has an exception" is well exemplified by the following unique case. Corporal C. was accepted for service with the notation "pulsus alternans and arrhythmia." He fought the "Boche" at Chateau Thierry, came down with influenza, at which time the arrhythmia and alternating pulse was again noted, and finally, after twenty months' service, was duly discharged apparently none the worse for the wear and tear.

#### CONCLUSIONS

The effort syndrome is responsible for a higher morbidity rate in active military service than all other cardio-vascular disorders together. It not only directly incapacitates a large number of men, but indirectly, through simulating organic diseases, leads to unnecessarily high discharge rates. In the 2,400 cases of this study it probably accounted for 40 of the 60 discharges and over half of the 62 admissions to sick report. To the inexperienced it is particularly likely to be confused with mitral regurgitation, hyperthyroidism and myocarditis.

In the present state of our knowledge and experience, functional murmurs should readily be differentiated from those connoting valvular disease in an overwhelming majority of cases. In this series, in 1,146 men in which the history and physical examination were reasonably complete, the distinction was apparently correctly made in over 99 per cent of the cases.

For practical purposes the following criteria justify the diagnosis of mitral regurgitation: (a) Systolic murmur at the apex associated with cardiac hypertrophy;<sup>1</sup> (b) systolic murmur at the apex in an individual giving a history of rheumatism (rheumatic fever, chorea and tonsillitis) and associated with either accentuation of the pulmonary second sound or poor response to exercise. As these postulates are based on men of military age, caution should be exercised in applying them indiscriminately to older individuals. The lesser findings referred to in this paper and many that have not been discussed, with the possible exception of alteration of the first sound, may strengthen the diagnosis of mitral regurgitation, but in the absence of the criteria given are not of diagnostic value.

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<sup>1</sup> It is fully appreciated that an individual may have a functional murmur associated with a concurrent hypertrophy due to independent cause as hypertension; likewise one may find a functional murmur in a subject who gives a history of rheumatism and who reacts poorly to exercise or who shows accentuation of the pulmonary second sound due to a concurrent neurosis in the former case and pulmonary congestion in the latter case produced by obstruction to pulmonary circulation or emphysema. Such an association of disorders is, however, unusual, and when present a careful examination will establish the presence of the concurrent disease.

# NOTES ON THE HISTORY OF MILITARY MEDICINE

(Continued from February, 1922)

By LIEUT. COLONEL FIELDING H. GARRISON

Medical Corps, United States Army

## THE RENAISSANCE PERIOD

IN ONE of his addresses, President Lowell of Harvard observed:

"It is hardly an exaggeration to summarize the history of four hundred years by saying that the leading idea of a conquering nation in relation to the conquered was in 1600 to change their religion; in 1700 to change their trade; in 1800 to change their laws, and in 1900 to change their drainage."

Even before 1600, and indeed following the Reformation (1517-34), most of the wars of the 16th century were religious wars. The most dramatic events of the period, the *autos-de-fé* (1482-1800), the Peasants' War (1524-5), the execution of Sir Thomas More (1535), the burning of Servetus (1553), St. Bartholomew's (1572), the execution of the Queen of Scots (1586), the Armada (1588) were all occasioned by the theological hatred which moved the religious of whatever persuasion to persecute and torment the heretics of their respective creeds. Antagonisms of creeds brought on such lengthy wars as those against the Huguenots (1562-1609), the Revolt of the Netherlands (1572-1609), the Thirty Years War (1618-48), and the wars waged by Louis XIV against Holland and Germany (1672-97). During the 15th and 16th centuries, the art of war was profoundly modified by the introduction of firearms and artillery, which widened the distance between the fighting lines, gradually did away with *armes blanches* and revolutionized the practice of military surgery. At Crécy (1346), Poitiers (1356) and Agincourt (1415), the yeoman-archers of England had demonstrated their superiority over the feudal cavalry, while wandering knight-errantry had long before received its final crushing defeat at Mansurah (1250), the last battle of the Crusades. The straggling caravans of chivalry were replaced by well-drilled bodies of mercenary heavy infantry, marching to drum and life, such as the *condottieri* of Italy, the *Landesknechte* of Germany and Switzerland or the Swiss Guards (*Suisses*) hired by France, Spain and the Papal See. From these organizations, with their regimental system, was gradually evolved the modern concept of national armies. The fierce hatred everywhere engendered against lawless, swaggering mercenaries and military adventurers, e.g., in England after the Wars of the Roses (1455-85), forms the leading motive of Machiavelli's Art of War (1521).<sup>1</sup> Readers of Charles Reade's "Cloister and the

<sup>1</sup> Capt. C. F. Atkinson: *Encycl. Britan.*, Cambridge, 1910, II, 597-599.

Hearth" and similar books will recall how unsafe it was in this period to cross any part of continental Europe without arms or bodyguard. Yet this was the age which witnessed the Renaissance or Revival of Learning, and the Renascence or new-birth of Western civilization, in which the invention of printing (1448), the dispersal of the Greek scholars over Europe after the fall of Constantinople (1453) and of the German printers after the sack of Mainz by Adolph of Nassau (1462) were factors of moment. In art and science, the period was one of extraordinary brilliancy, as witness such great figures as Leonardo da Vinci (1452-1519), Michael Angelo (1475-1564), Albert Dürer (1471-1528), Shakespeare (1564-1616), Copernicus (1473-1543), Paracelsus (1493-1541), Vesalius (1514-64), and Paré (1510-90). The publication of a large body of scientific writings in the vernacular marks a distinct break with the past and Paracelsus was the first to discard the practice of lecturing on medicine in Latin. The grand achievement of Renaissance medicine was the revival of scientific anatomy by Leonardo da Vinci (1512) and Vesalius (1543), which was followed by a host of anatomical discoveries, all of physiological import, and led to the rehabilitation of operative surgery by Paré and of experimental physiology by Harvey.

While military surgery became a new thing in the hands of Paré, military medicine continued to lag behind and for the following reasons. Before the advent of Paré, educated surgeons, attached as of old to the persons of powerful nobles, did nothing whatever for the common soldier, and the few surgeons of lower caste, employed as a business insurance for the mercenary troops and required by them, were usually men of small education who acted as barbers for the officers. But as the mercenary organizations gradually merged into the standing armies of Charles VII (1448) and Maximilian I, the number of medical personnel for the rank and file was increased and better medical administration was thereby secured. Toward the end of the 14th century, over and above such evacuation of the wounded by comrades as we read of in Froissart, it had become customary to hire a number of barber-surgeons to treat the wounds of ordinary soldiery. Thus, while we find such able physicians as Colnet and Morestede with Henry V at Agincourt (1415), Gersdorff with the Swiss Confederates at Grandson and Murten (1476), Gabriel Miron with Charles VII at Naples (1494), Marcello Cumano with the Milanese at Novara (1513), Symphorien Champier with Francis I at Marignano (1515) and Louis Desbourges at Pavia (1525), there begin to appear, in the city archives of the Swiss cantons and elsewhere, evidences of the authorized employment of barber surgeons to treat the wounded at public cost.

*State Care of the Wounded by the Swiss Confederation*

In his carefully documented study of the care of the wounded in the wars of the Swiss Confederation (1315-1798),<sup>2</sup> Dr. Conrad Brunner has demonstrated a fact hitherto unknown to historians, namely that Switzerland antedated all other nations of modern Europe in state care of the wounded, i.e., in actual municipal ordinances notifying the individual soldier that his government was behind him in respect of his welfare on the field of battle.

When the cantons of Uri, Schwyz and Unterwalden concluded their pact of eternal federation (1291), there began a long series of bloody wars with outland enemies and of fierce internecine struggles between rival groups of cantons which resulted in the ultimate autonomy of the Helvetic Republic. At Morgarten (1315), Laupen (1339), Sempach (1386), Näfels (1388), Grandson (1476), Murten (1476), Nancy (1476), Giornico (1478) Dornach (1499), Novara (1513) and the first day at Marignano (1515), the valorous Swiss were able to demonstrate repeatedly that whatever huge force confronted their small, detachments was, like Bret Harte's grizzly, only a "coward of heroic size," and so well-earned and well-established is their reputation as sturdy, invincible fighters that their European neighbors have seen fit to leave them unmolested to date.

Brunner's researches show that from the date of the battle of Laupen (1339) onward, the accounts in the Swiss archives are replete with disbursements of moneys for the care of the wounded and their dependents. In the earlier period, these consisted of payments to various barber-surgeons for attending the wounded after battle, e. g., those made by the city of Berne after the Gugler War (1376), the siege of Burgdorf (1383) and the Zürich Wars (1436-50) or by St. Gall after the siege of Rheinegg (1405). This gradually became custom in all the cantons. In the archives of the Zürich Wars, we find the council of Lucerne authorizing that the wounded should continue to receive their pay as long as the troops remained in the field (1444). During the Müllhausen War, an order goes forth from Berne that Marcellin the barber shall accompany a well-equipped force of 130 men (June 15, 1467). During the Burgundian campaign, (1474-77), a similar ordinance is issued by Basel, detailing two barber-surgeons to accompany the troops, with provisions for continuing the pay of the wounded for the period of the war (March 30, 1474). In an order of the day following the battle of Grandson (1476), it is promulgated that all living expenses of the wounded and all costs for medical attendance shall be paid "in moderation" out of the common purse (May 15, 1476), with a subsequent protocol of account, showing expenditure of 300 guilders for 200 wounded or 1½ guilders *per capita*. After Grandson, the council of Lucerne further decreed that the property of children orphaned by the war should be carefully guarded by the state, with restitution in case of embezzlement by officials, that the state should pay not only for treatment of the indigent wounded up to recovery, but should also pay for the maintenance of themselves and family until they were able to resume work. This is also verified by the city accounts of 1476. After the battle of Dornach (September 2, 1499), the Bernese devoted all the booty, a sum of 800 pounds, to the maintenance of the wounded and of the widows and orphans of the slain. The account-books of both Berne and Solothurn for 1499-1500 show that these items continued to be paid out of the city funds. In the Italian campaign of 1500-29, the cost of caring for the Swiss wounded was borne by the Duchy of Milan, e. g., 4 guilders *per capita* after the taking of Pavia (1512). After the battle of Kappel (1531), the city-accounts of Zürich for 1531-32, show a disbursement of 1358 pounds for care of the

<sup>2</sup> C. Brunner: *Die Verwundeten in den Kriegen der alten Eidgenossenschaft*, Tübingen, 1903.



wounded, bandaging material, tips to surgeons' apprentices, moneys advanced to the wounded themselves, and expenses of sending convalescents to mineral baths, while expenses of wagon transportation amounted to 16 pounds or more. The non-transportable wounded were treated at public cost in an improvised hospital in the cloister at Oetenbach. After the peace between Berne and the five Catholic cantons (1533), sick and wounded war prisoners were allowed to return to their homes without ransom, upon payment of living expenses and cost of medical attention. In the so-called period of "capitulations" (1531-1600), in which the cantons hired out their troops to France, Spain and the Papal See, the financial obligation of caring for the sick and wounded is expressly stipulated in the tightly drawn contracts between the separate cantons and these neighboring states.<sup>3</sup> In the muster-rolls of detachments ordered to field duty by the different cantons during 1371 to 1584, the names of the barber-surgeons and physicians detailed are always given. In a muster-roll of Basel (1542), the title "field-barber" (*Feldscher*) appears for the first time, and chief field-barber (*Oberster Feldscher*) in a Bernese roster of 1589. On account of the fierce spirit of the times, all medical personnel bore arms and before 1589, the field-apothecaries were not even listed among the medical personnel but participated as combatants. As judged from the municipal account books, the fees accorded the barbers for field services and care of wounded after battles were handsome allowances for the times.<sup>4</sup> When the Swiss began to hire out their men-at-arms as mercenaries, they proved hard bargainers for their employers, whence the proverb, *Point d'argent, point de Suisse*. Contrary to French and German practice, no attempt was made to collect or relieve the wounded until after a battle. The so-called Sempach Pact (1393), concluded between nine cantons, specifies that the wounded should not attempt to escape during a battle, but were to remain standfast within the lines until the end of the action, lest they incur the penalty of desertion. Fighting in these early days was desperate and bloody, both the prisoners and wounded were commonly massacred, and no quarter was shown the enemy on either side. The Swiss Confederates were required to take a barbaric oath to spare none of the enemy and to permit none of their own men to be captured. This was customary until the beginning of the 16th century, when return of prisoners and wounded was permitted. But once accepted, this humane principle was lived up to with characteristic fidelity and reliability, and it is significant that the Red Cross idea was eventually established by a Swiss, Henri Dunant. During the recent European war, the peoples of the different Swiss cantons voluntarily displayed the most magnanimous charity toward the war prisoners and refugees within their frontiers, paying for their maintenance out of their own pockets, even to their own impoverishment, an object lesson in practical internationalism to all nations of the civilized world.

### *Reforms of Maximilian I and Later Developments*

The origins of standing national armies are commonly traced to the changes in military organization initiated by Charles VII of France and Maximilian I of Germany. To put a stop to the brutal plundering of the people by wandering mercenary soldiery, Charles VII (1422-61) instituted *compagnies d'ordonnance*, i.e., troops solely under the orders and authority of the king, and not likely to change sides at the instance

<sup>3</sup> For example, in the contract made by the cantons of Wallis and Graubünden with Leo X. (1514), "Ist abgeredt das päpstliche Heiligkeit denselben (i.e., the wounded) so lang sy in suer Heiligkeit dienst vnd vff der widerfahrt sind, iren soll bezalen vnd sy nit minder noch anders dann die wellmogen den solle halten." In the contract with Spain (1514), wagon transportation of the wounded is stipulated. Brunner, *op. cit.*, 57.

<sup>4</sup> See, for examples, Brunner, *op. cit.*, 52-54.

of the highest bidder or to raid unprotected territory, in free-lance fashion, to suit the caprices of their reckless managing directors. These companies had an average strength of 600 men each, but no regular medical personnel. After the battle of Bosworth Field (1485), the example was followed by Henry VII of England, in his "yeomen of the guard," a small band of 50 archers.<sup>5</sup> In like manner, Maximilian I (1459-1519) recruited his standing army of *Landesknechte* (native-born soldiers) from the people, principally as a weapon of offence against the menace of Turkish invasion. These were heavy foot-soldiers, armed with musketry as well as halberds, bows and arrows. This organization of *Landesknechte*, further developed by Charles V (1519-56), was principally fostered by Georg von Frundsberg (1473-1528), whose concern for the sanitary welfare of the soldier was highly praised by his contemporaries. Its administration is described at length in the treatise on Imperial Courts-Martial of Leonhard Fronsperger (1555),<sup>6</sup> whose instructions to medical personnel were regarded by Frölich as the basis of the medical regulations of the modern German army.<sup>7</sup> In this organization, each aggregation (*Hauffen*) of 5,000-10,000 men was divided into regiments, consisting of 10-14 or more "standards" (*Fähnlein*) or troops of 400 men each. To each troop, each company of infantry (200 men), and each squadron of cavalry was assigned a barber-surgeon (*Feldscher*) at a double salary of 4 guilders monthly. The commander of each *Hauffen* had attached to his staff a field physician-in-chief (*Obrist-Feld-artzet*) and a field-barber (*Doktor und Feldscher*). The field marshal of cavalry had a physician (*Doktor der Artzeney*) and the Chief of Artillery a surgeon (*Wundartzet*), at a monthly salary of 30 guilders, with an assistant barber (*Scheerer*). The field-barber ranked between a clerk and a halberdier or between a quartermaster sergeant and a corporal.

Fronsperger's regulations concerning the physician-in-chief and the field-barbers have been translated by Heizmann<sup>8</sup> as follows:

The physician-in-chief must have been a doctor, or one who had recently charge of surgeons or field-barbers by state authority; he must be a well-known, skillful, experienced and cautious man, of the proper age, upon whom all barbers, sutlers, wounded, sick and stricken could rely for help and counsel in time of need, particularly when they are shot, cut, bruised or broken, or are suffering from any accidental or disabling diseases, such as scalds, fluxes, fevers, and similar affections that occur among soldiers. His duties are even more extensive in that he should inspect, both when the regiment is organized and later at monthly muster, the instruments and everything pertaining thereto, and when he

<sup>5</sup> A. A. Gore: *The Story of our Services under the Crown*, London, 1879, 35.

<sup>6</sup> L. Fronsperger: *Vom Keyserlichen Kriegsgerechten, Malefiz und Schuldhändler, Ordnung und Regiment*, Frankfurt am Main, 1555.

<sup>7</sup> Frölich: *Deutsches Arch. f. Gesch. d. Med.*, Leipz., 1880, III, 256.

<sup>8</sup> C. L. Heizmann: *Ann. Med. History*, N. Y., 1917, 18, I, 283.

finds anything lacking or lost, such shall be charged to the field-barber, to make up the deficit. When this cannot be done, he shall find other means to meet emergencies. On the march he will closely attend his commanding officer. When exigency or peril impends from the enemy, in battle array or skirmishes and such like, he shall remain in the neighborhood of his superior military officer; but he will also oversee as much as possible the other physicians, surgeons and the like, wherever wounded, etc., are to be attended, and he shall devote his care, advice and skill to all others, particularly because he, above others, is ready with instruments, apothecaries and medicines for both internal and external wounds and sickness.

He should also with all diligence, advise whether a leg, arm or such should be amputated or preserved by other means. Further, he should give his attention to the severely wounded, that they may not be left too long on the lines or in the companies, but immediately carried to the surgeons and aided by beneficial dressings. On the march, when it becomes important to have a field-barber near at hand or available, it is his business to see that one is stationed between the cavalry and infantry, with his instruments. On other occasions, in camp and quarters, each barber remains with the troop in which he has been assigned for duty. Whenever a question arises between barbers and cured soldiers or others, as to the payment to be made, he shall settle it, seeing that neither too much nor too little is given.

As it is necessary that a field-barber or surgeon serve with each troop, so should each Captain be careful to select a well-versed, skilful, experienced and trained man, and not a poor beard-shaver or bath-boy as often happens by reason of favor; thus, the killing or maiming of good soldiers may be prevented. The field-barber should be supplied with all necessary medicines and instruments in a field wagon, and the Captain should see that it is done. He should be a capable *Knecht*, to help in necessity. His duty is to render assistance first, when there is need, to those of his own troop, not to exact too much from anyone, but to treat men at reasonable and like rates. He shall have his lodging at night at the company pennant, so that he may be found in necessity, and it is best that one barber should be accessible to each lodging house, on account of the sick and wounded. He shall serve with his troop in all else like an ordinary soldier, and he shall receive double pay.

Here we have a spirit of organization and a sense of discipline which shows considerable advance, even upon Roman or Byzantine standards. In the armies of Charles V, the sick and wounded were sent to the baggage train, and put under tents (the field hospitals of his grandmother Isabella), where they were attended by physicians or barbers and nursed by the innumerable female camp-followers, who, as we shall see, lived with the soldiers as actual or putative wives, and with their children, performed the most menial duties. On breaking camp, wagon transportation was employed for the light sick and slightly wounded, while more desperate cases were sent to hospitals in the nearest towns. A *Spitalmeister* or hospital-superintendent, selected and paid by the *Landesknechte* in common, was delegated to look after the sick in hospital or on the march, and to furnish supplies. When the army moved forward, couriers were despatched ahead to locate suitable quarters, including a house for the barber-surgeons and their patients. In battle, the medical personnel were located with the rear-guard, with orders to

bring the wounded out of the lines to a safe place and bandage them. In the field, the sick or wounded continued to receive their pay.<sup>9</sup>

In France, the armies of Charles the Bold, Duke of Burgundy (1433-77) had a surgeon attached to every company of 100 lancers, i.e., one surgeon to every 800 men, over and above the physicians attached to the Duke and his vassals. The lancers received twelve crowns monthly, the physicians five. The court of Charles had attached to it 6 physicians, 4 surgeons and 40 assistants, and it is said that even this personnel, large for the times, was not adequate to look after the wounds incurred in battle, jousting at tournaments and knightly exercises. Charles is highly praised for his fatherly care for the sick and wounded by the European historians. At the end of the century, as we shall see, stationary military hospitals, with ambulance service for first aid, were established by Sully (1597), in the reign of Henri IV, and were so well managed that even high officers were content to be treated in them.<sup>10</sup>

When Edward IV of England (1461-83) joined the army of Charles the Bold in his campaign against Louis XI (1475), he had with his forces a chief physician, 2 body physicians, a surgeon and 13 assistant barber-surgeons. Prior to this time, the field surgeons Colnet and Morstede, who accompanied Henry V to France (1415), with 15 assistants, were indentured to the King, with later authority to "press" surgeons and instrument-makers into the military service. Annuities were sometimes granted to the severely wounded in this period, and by the time of Henry VIII (1509-47), a definite system of pay for soldiers and army surgeons was established, although the medical personnel, as described by Gale, was poor in quality. At the battle of St. Quentin (1557) the English Army had a regular medical staff, consisting of 2 surgeons attached to the general, and one each to the lieutenant general, the high marshal, the general of horsemen, the captain general of footmen, and the master of ordnance, as in Fronsperger's arrangement of 1555. There were in all 57 of these surgeons at a salary of 1 shilling per diem for infantry service and 2s for cavalry. In the army mobilized to repel the Armada (1588), this had been raised to 1s. 6d. daily, being sometimes supplemented by a stoppage out of the soldier's pay of 2d. monthly, the origin of "hospital funds."<sup>11</sup>

In Italy, the different city-republics—Florence, Venice, Naples, Ferrara, Verona—had, from the 13th century on, a small surgical personnel attached to their armies, usually 2 surgeons at a salary of 40 soldi daily, while 40 galleys of the Genoese Navy, had one barber and

<sup>9</sup> Heizmann: *op. cit.*, 282.

<sup>10</sup> Brunner: *op. cit.*, II, 15.

<sup>11</sup> A. A. Gore: *op. cit.*, 32-11. Brunner, 15-17.

an assistant barber for their complement of 210 men each (1337). Italian military surgeons of higher caste were later prominent as authorities on gunshot wounds.<sup>12</sup>

In Spain, the tradition of ambulance and field hospital service, established by Isabella, appears to have been kept up, and the infantry regiments (*tercios de infanteria*) of the armies of Charles V had each a physician and a surgeon, at monthly salaries of 15 and 12 escudos respectively. Toward the end of the 16th century a stationary military hospital was erected at Pamplona by Captain General Gonzaga Colona. The Invincible Armada (1588) had a hospital-ship, but its history was swallowed up in the destruction of that fleet.<sup>13</sup>

### *The Siege of Metz*

As a sidelight on military sanitation in the period, Heizmann has rightly signalized the defense of Metz (October 20—December 26, 1552) as the high-water mark of medico-military administration in the 16th century.<sup>14</sup>

He points out that in the 16th century, the proportion of sieges to battles was 2:1, due to the new element of heavy artillery, which forced troops to seek shelter within the ramparts of towns. Of 57 besieged towns, Heizmann notes that "24 were carried by assault, 20 capitulated and 13 were relieved or abandoned." In other words, famine and disease had as much to do with results as military science. Although the lessons learned by the mediaeval peoples about Mosaic hygiene, the doctrine of "eight" communicable diseases and the isolation of possible carriers had not been forgotten, the memoirs of the time teem with recitals of great suffering and high mortality from dirt, disease and neglect. Why? The only answer is perhaps that "man is an animal who is fain to lie in the unclean straw of his intellectual habits." Medico-military administration, as a definitive purposeful mechanism to force commands and individual units to keep themselves and their surroundings clean, was almost non-existent and its perfection had to wait upon the advent of Pasteur, Koch and Lister, from whom came the newer concept that sanitation is personal or community asepsis.

Prior to the siege of Metz, the armies of France, which had captured Toul, Metz, and Verdun, had become deplorably weakened by famine, due to the fact that the troops were outnumbered by their camp followers, who loaded the supply wagons with useless plunder, while reckless drinking of suspicious water caused "great diseases, pleurisies and fevers." Confronting the besieged town was the army of Charles V, consisting of 14 regiments (141 companies) of *Landesknecchte*, with the rudimentary medical establishment described by Fronsperger, and an additional force of 120,000 Spanish and Italian companies, cavalry and pioneers, with 140 pieces of artillery. Opposing this gigantic army, twice the size of any other for more than a hundred years, the Duke of Guise had within the walls of Metz only 12 companies of infantry (4,600 men), 444 horse and 920 gendarmes. Yet so ably was the defense of the town conducted that in 65 days the besieging armies began their retreat, on December 26, 1552. Guise had made the most elaborate preparations by purchasing animals, storing provisions, razing superfluous structures, expelling useless

<sup>12</sup> Brunner: *op. cit.*, 17-18.

<sup>13</sup> Brunner: *op. cit.*, 19-21.

<sup>14</sup> Heizmann: *op. cit.*, 231-237.

persons, classifying all others according to industrial capacity and devising effective sanitary measures. Soldiers sick with communicable diseases were isolated at once; the wounded or sick were taken immediately to hospital; barber surgeons were provided with money to obtain material for wound-treatment; pioneers were ordered to remove all filth and carrion and to keep the streets always clean. The supply list, as given by Paré was lavish and rations were carefully doled out toward the end of the siege. Paré himself was the leading spirit of the medical personnel and through his big humanity, the wounded soldier for the first time in history received attention from the body-physicians of nobles. Prisoners of war were treated with great consideration and indeed, brought epidemic typhus into Metz after the raising of the siege. The besieging armies suffered enormously from the bitter cold, lack of food and clothing, frostbite, dysentery, scurvy and typhus fever, losing in all some 20,000 men. The retreat was hurried, and in such bad order that the dead were left unburied and many of the sick and wounded were abandoned. These were collected and sent to hospital by Guise, while Alba was notified by a trumpeter that a safe conduct and water transportation would be granted to those conducting disabled prisoners to Thionville.

"The defense of Metz," says Heizmann, "became the marvel of Europe; it, without, doubt, saved France from destruction, and, in many ways, besides political, its effects were lasting. Wounded soldiers were afterwards better treated, as at the siege of Thionville, 1558, and after the capture of Havre, 1563, when the project of an *Invalides* originated with the Queen Mother, though it was not carried out for many years. The humanity of Guise towards both well and sick was remembered at the siege of Therouanne, 1553, by the Spanish, who, on being reminded of it by the French, courteously saved all prisoners, says Brantôme. After this the custom of massacring prisoners who were not reserved for ransom, gradually declined, and this was the germ from which arose the spirit that culminated, in a little over 300 years, in the articles of the Geneva Convention."

### *Battle Losses up to the 17th Century*

As Frölich observes,<sup>15</sup> reliable figures of battle losses in the Middle Ages are scarce, doubtless for the reason that, in the unsettled condition of times, few counts were taken and few people were competent to handle statistics. The losses among the Northern barbarians were probably tremendous. When Aetius defeated Attila in 451, the latter lost 160,000—300,000 out of a horde of 700,000. According to Procopius, the wars between the Ostrogoths and Byzantines occasioned the destruction of over 15 million men. At Fontenay (841), 100,000 Franks were killed. The Hungarians, defeated by Henry I at Merseburg in 933, lost 80,000. The Crusades occasioned the destruction of three million (two million Europeans) in 194 years. When Rudolf of Hapsburg defeated the Bohemian King Ottokar in 1278, some 14,000 were slain. At the battle of the Spurs (1302), 1,200 French knights were killed. At Crécy (1316), the losses were 2,500 nobles, 4,000 horsemen and 30,000 soldiers.<sup>16</sup> The Mongol invaders, from Gengis Khan (1214) to Tamerlane (1369-1405) devastated vast regions and destroyed whole cities and their populations, sweeping from Manchuria to Liegnitz (Silesia) in 1235-41. During the contests among the mediæval Italian cities, there were a number of droll battles with no casualties whatever, due to the protective efficiency of heavy plate armor. Cortez in México lost only 30 out of his 400 men during 1519-20, but some 4,300 out of 8,000 on his march to the coast (1520); he destroyed 200,000 city Mexicans in 1521. During the Peasants' War (1523-25) 16,000 were killed in Thuringia alone, and 7,500 at Frankenhäusen (1525). At the massacre of St. Bartholomew (August 24, 1572), 30,000 people

<sup>15</sup> Frölich, *Zeitschr. f. Krankenpflege*, Berl., 1896, XVIII, 45.

<sup>16</sup> Frölich, *Ibid.*, 66-67.

were slaughtered. At St. Jakob de Birs (1444), 1,300 of the 1,500 Swiss Confederates were killed and 200 wounded, while the Armagnacs lost 2,200 killed and 400 wounded. At Grandson (1476), 1,000 Burgundians were destroyed; the Swiss mortality is not known, but the records show 400 wounded. At Murten (1476), 11,000 Burgundians were killed, while the Swiss lost 500 and many wounded. At Frastenz (1499), 3,000 Swabians were killed and 1,300 drowned; the Swiss records show only 12 killed and 60 wounded, which is a strain upon our credulity. In the Italian campaign of 1500-29, 1,500 Swiss were killed and 1,500 wounded at Novara (1513) out of an army of 5,000, while 8,000 of the enemy were slain; at Marignano (1515), the Swiss army of 24,000 lost 6-7,000 killed, and 1,500 wounded, the French about the same number. At Pavia (1524), the Swiss lost 6,000.<sup>17</sup>

### *Epidemic Diseases*

In the 16th century, small-pox, measles, typhus fever, yellow-fever, diphtheria, whooping cough, influenza, lead poisoning and ergotism, began to make their appearance in epidemic form, for the first time, as records go, and of these typhus fever, small pox and the various modes of influenza were the principal scourges of camps. Small pox, measles and scurvy were mainly rampant in the Germanic and Scandinavian countries. Yellow fever was confined to the West Indies. Typhus fever broke out among the Spanish troops after the siege of Granada (1489), where it was called *labardiglio* (the red coat). It became epidemic in Italy in 1505 and 1524-30, and was first described by Fracastorius (1530), and in Mexico by Francesco Bravo (1570). The so-called Hungarian disease (*morbus Hungaricus*), which spread all over Europe in 1501 and 1505, was probably typhus fever, and was a formidable menace of armies. The so-called epidemic of syphilis at the "siege" of Naples (1495) has been shown by Sudhoff to have been, in reality, typhoid fever. Diphtheria, described by Schedel in 1492, was six times epidemic in Spain (1581-1600) where it was described by native writers as *garrotillo*, and reached Italy in 1618. Whooping cough was first described by Guillaume Baillou in 1578. The various forms of ergotism were some of them modes of influenza, and Crookshank has shown that the variety known as *Kriebelkrankheit* was, in all probability, encephalitis lethargica.

### *Prostitution and Syphilis in Armies*<sup>18</sup>

In the armies of ancient times, promiscuous sexual relations with attractive female harp and flute-players and slaves were common and commonplace. As reflected in Homer, Athenaeus, Lucian, Plautus (*Miles Gloriosus*) and other writers of antiquity, the attitude of the Greeks, Romans and Asiatic peoples toward such matters was that of later continental Europe, which needs no further qualification or discussion here. In the *Anabasis* (IV, 3; VI, 1), Xenophon refers to the horde of *hetairae* who accompanied the Ten Thousand on their retreat after the battle of Cunaxa (401), and the concern which the troops displayed for their safety. Philip of Macedon, however, exhibited no such tolerance and his example was followed by his son, Alexander the Great up to his entry into Babylon, when his system of restraint broke down, and his own end was the consequence of reckless and imbecile dissipa-

<sup>17</sup> Brunner: *op. cit.*, 73-74.

<sup>18</sup> For an exhaustive account of this matter, see W. Haberlug: *Das Dürrenwesen in den Heeren und seine Bekämpfung*, *Zschr. f. Bekämpfung d. Geschlechtskr.*, Leipzig, 1914, XX, 61, 103, 143; 169; 312; 323.

tion. In the Roman armies, women were not tolerated in the camps, before the time of Septimius Severus (193-211 A.D.), who permitted the soldiers to live with housekeepers (*focariae*).<sup>19</sup> Soldiers were not permitted to marry while on military duty, but for this very reason, the entry of soldiers into distant towns, or into Rome after a campaign, was followed by general relaxation of morals; and as Mommsen shrewdly observes, this laxity was tolerated and winked at by the Roman authorities as relieving the army of the expense of caring for children and other incidents of the married state. In the 4th century, the newer privilege of a wife or housekeeper and children was continued, as recorded in the Theodosian Codex (VII, 3, 6), but they were not permitted in camp, except as a special privilege (VII, 1, 3). During the Middle Ages, the Crusades and other military expeditions were usually followed by great swarms of women, in spite of regulations to the contrary, and military orders cutting down the number were made solely for economic reasons, viz., to limit the number of mouths to feed in camp. In the mercenary armies of the 15th and 16th centuries, the late Roman practice of tolerating *focariae* was revived among the *Landesknechte*. These female camp-followers (*Marketenderinnen*) lived with the troops, bore them children, did nimble shilling business in doling out wine, and functioned generally as cooks, housekeepers, sempstresses and nurses for the sick and wounded. On the march, these poor women were veritable beasts of burden, carrying on their backs all the soldier's luggage, as well as his illegitimate infants. Blows and curses were their portion, if not constantly employed in collecting firewood and other chores, and they were frequently fought for and exchanged like slaves. As depicted in the prologue to Schiller's *Wallenstein*, the attitude of the wandering *Landesknechte* toward these women was one of broad, humorous toleration. All this was to take on a different aspect through the introduction of a new factor, viz., the advent of syphilis. Where syphilis came from, no one knows. The most rational solution of its mysterious apparition in the Middle Ages is that of Professor Sudhoff.<sup>20</sup> There was no demonstrable syphilis in prehistoric times, nor in antiquity, and it is not mentioned by Dante, Chaucer or Boccaccio, all keen observers of the life around them. But Sydenham, with remarkable insight, pronounced European syphilis to be a modified West African yaws, and Sudhoff believes that it existed in Europe in the form of a mild endemic spirochaetosis as early as the 12th century, if not before. This view is not unreasonable, since the spirochaetae, of whatever kind

<sup>19</sup> *Focariae*, literally, guardians of the hearth or fire-makers.

<sup>20</sup> See Sudhoff: *Graphische und typographische Erstlinge der Syphilis*, Leipzig, 1912; *Aus der Frühgeschichte der Syphilis*, Leipzig, 1912; *Mal frauzoso in Italien*, Gießen, 1912, and his summary of the whole matter in *Bull. Med. History Soc.*, Chicago, 1917, II, 15, 24.



are, in all probability, parasites of tropical provenance, and the Arabian physicians, in Asia and Africa, were the first to use mercurial ointment for a mysterious group of cutaneous eruptions which were confused with scabies and leprosy. As the successful exhibition of quinine diagnoses most varieties of malarial infection, so the cleaning up of these eruptions by mercury points to lues venerea. This inunction treatment became common practice among the Salernitan and later surgeons long before the alleged importation of syphilis by Columbus' sailors in 1493. Probably before 1275,<sup>21</sup> Saliceto had declared chancre to be due to *coitus cum meretrice*, and even recommended a prophylactic vinegar solution (*ablutio cum aqua frigida et roratio loci cum aceto*). To the outcast barber surgeons of the 12th-14th centuries, who were the natural physicians and familiars of the prostitutes of the time, the disease was variously known as *scabies grossa*, *variola grossa*, *grosse vérole*, *gros mal* and *mal franzoso*. In 1463, a courtesan of Dijon testified in court that she had kept off an unwelcome suitor by stating that she was sick with the *gros mal*. The alleged outbreak of syphilis among the troops at the siege of Naples (1495) is held by Sudhoff to have been an epidemic of typhoid or paratyphoid infection, and two months before these troops got away from Novara on October 10, 1495, syphilis was spreading in Germany (as shown by Emperor Maximilian's Edict of August 7), and had been already noted by Trithemius and Brunschwig in 1493. While the account book of the syphilis hospital at Augsburg during 1497-1852, investigated by Sudhoff, shows that the disease never really attained epidemic proportions, there is no doubt that wandering *soldatesca* furnished a large quota of carriers. The important thing is that the prostitute as a carrier was recognized by the surgeon Saliceto before 1275, and in a French court of justice in 1463. As in the mediæval ritual against leprosy, the unfortunate syphilitics were driven from the towns, to spread the disease elsewhere, until hospitals were created for them. The effects of the disease after 1495 were particularly malignant and loathsome, as in the syphilis of the South Seas or the "Black Lion" of the Peninsular War, yet in the many military orders restricting the number of prostitutes in camp,<sup>22</sup> there is no mention of the possibility of infection before the proposition of John of Nassau in 1608.<sup>23</sup>

<sup>21</sup> The *Cycurgia* of Saliceto, first printed at Piacenza in 1176, was begun in 1269 and completed June 7 B. 1275 (Sudhoff).

<sup>22</sup> For example those of Francis I (1514), Charles IX (1570) and Henry III (1579) in France, Albert the Pious in Belgium (1580), Maximilian II (1570) and the German articles of War of 1521. Haberland, *op cit.*, 169-173.

<sup>23</sup> Haberland: *op. cit.*, 173-174.

*Military Surgery in the 16th Century*

War surgery in the 16th century underwent many changes through the necessity of dealing with gunshot wounds.<sup>24</sup> Gunpowder was described by Roger Bacon (1214-92) about the middle of the 13th century; canon were manufactured at Ghent a hundred years later, were perhaps in use at the battle of Bannockburn, (1314) and were certainly employed at Crécy (1346). At the siege of Harfleur (1415), there was a regular service of ordnance, and in later military operations, such as the Hussite wars or the siege of Constantinople, the artillery played an effective part. Small fire-arms were at first so heavy and clumsy that they had to be mounted. The arquebus derived its characteristic bend and trigger from the cross-bow, acquired a wheel-lock in 1515, and through the substitution of a flint-lock for a matchlock (1671) was transformed into a musket.

The first mention of gunshot wounds is to be found in the treatise on military surgery of Heinrich von Pfolspenndt (1460), one of the Teutonic Knights. He treats mainly of arrow wounds, but describes the removal of powder from gunshot wounds by irrigation with human milk and the removal of bullets by means of the sound:

With the sound you must lift out the little load or bullet which was propelled into the body by the musket, and whatever else was discharged into the wound:

Marcello Cumano, in his *Vademecum*, says a few words about the painful character of these wounds. The next authority, in order of time, is the "Book of Surgery" of the Alsatian army surgeon, Hieronymus Brunschwig (1497).

Brunschwig regarded gunshot wounds as poisoned, advises removal of the poisonous powder by the seesaw motions of a silken seton through the sinus and extraction of the bullet with the forceps, after enlargement of the wound by incision or by the "wound-dilator." He believed in the promotion of suppuration (*laudable pus*) by insertion of bacon fat, as an aid in loosening the arrow or bullet before extraction.

Hans von Gersdorff, in his "Field Book of Wound Surgery (1517)" did not regard gunshot wounds as poisoned.

He treated them by rinsing with warm hemp-seed oil, to get rid of the powder, extraction of the bullet by various instruments, with a final dressing of "Egyptian ointment," compounded of honey, vinegar, verdigris and alum. Gersdorff performed amputation by Esmarching the limb with a constricting band, checking hæmorrhage by styptic

<sup>24</sup> For exhaustive accounts of the treatment of gunshot wounds in the 16th century, see: Th. Billroth: *Historische Studien über die Beurtheilung und Behandlung der Schusswunden*, Berlin, 1859; E. Gurlt: *Geschichte der Chirurgie*, Berlin, 1898, II, *passim*; Sir T. C. Albarr: *The Historical Relations of Medicine and Surgery*, London, 1905, *passim*; V. Fossel: *Mitt. der Ver. d. Aerzte in Steiermark*, Graz 1901, XLII, 161-173, N. Senn: *Surg. Gynec. & Obst.*, Chicago, 1907, V, 613-622; C. Singer: *Quart. Rev.*, Lond., 1916 (No. 117), 152-169, and Reinhold Winter: *Ueber die Verwundungen durch Feuerwaffen und die dazugehörigen Leistungen der Chirurgie im 15. und 16. Jahrhundert*, Breslau dissertation, 1917.

or cautery and enclosing the stump in a bull's (or hog's) bladder. Gangrene was the only indication for the operation in these times. Pfolspeundt, Brunschwig, and Gersdorff employed the mediæval substitute for anaesthesia, viz., inhalation of an infusion of opium, mandrake root, henbane, lettuce and hemlock from a "sleeping sponge." Gersdorff claims to have performed one or two hundred amputations without giving any opium internally. He treated ankylosed joints by forcible extension with an apparatus called *Narr* (fool). Both Brunschwig and Gersdorff abound in striking illustrations of the surgical practice of the time, e. g., the cauterization of a wound, the first picture of amputation, extraction of an arrow near a battlefield, decompression of the skull by a special elevator, leprosy, St. Anthony's fire, etc.

The view that gunshot wounds were poisoned burns was further upheld by the Italian surgeons Vigo and Ferri.

Giovanni da Vigo (1460-1520) physician to Julius II, deals with the subject in his surgical treatise of 1514. He regards gunshot wounds as contused, scorched, or poisoned, and recommends treatment with boiling oil or the actual cautery, a survival of the barbaric savage practice of branding which was recommended in a spurious Hippocratic aphorism and grafted upon European practice by the Arabian physicians. Alfonso Ferri (1515-95), who published the earliest work exclusively devoted to gunshot wounds (1552), is more moderate in his views. He observed that bits of clothing or armor driven into the wound may cause suppuration, advises probing for such objects, extraction of the bullet by a special forceps, hæmostasis by underpinning the cut vessel, and evacuation of pus wherever found. If a lodged bullet gave no pain or other trouble, he believed in leaving it alone.

In the meantime, the Swiss medical reformer, Paracelsus (1491-1541), had published his "Larger Wound-Surgery" (1536), in which he filed a vigorous brief for simple, expectant treatment of wounds and general "let well enough alone" in the matter of the use of greasy salves, plasters, boiling oil, hot irons and other abominations.

"Warily must the surgeon take heed not to remove or interfere with Nature's balsam but protect and defend it in its working and virtue. It is in the nature of flesh to possess, in itself, an innate balsam which healeth wounds. Every limb has its own healing in itself; Nature has her own doctors in every limb; wherefore every surgeon should know that it is not he, but Nature, that heals. What do wounds need? Nothing. Inasmuch as the flesh grows from within outwards, and not from without inwards, so the surgery of a wound is a mere defensive, to prevent Nature from suffering any accident from without, so that she may proceed unchecked in her operations."

This reasoning, the essence of true Hippocratic (or aseptic) surgery and the intuition of a man of genius, goes to show that the contention about the purification of gunshot wounds by the cautery and boiling oil was only one phase of a larger problem, which was now to be approached by the greatest military surgeon of the time, Ambroïse Paré. Paré came up to Paris in 1532-3, an unlettered barber-surgeon's apprentice, and after three years experience as interne (*compagnon chirurgien*) at the Hôtel-Dieu, divided all the rest of his long life between military surgery in the French armies and private practice in Paris.

Like John Hunter, he was lucky in that he had no scholastic training to interfere with the straightforward surety of his natural perceptions, while his hospital experience in dissecting, post-mortem work and practical surgery was of the best. When Paré began to make his reputation as a skilful surgical craftsman, Arabian doctrine, which divorced surgery from medicine and substituted the cautery for the knife, was bitterly upheld by the clerical bigots of the Paris Faculty (*les chirurgiens de longue robe*), and although Hippocrates, Hugh of Lucca, Theodoric of Cervia and Henri de Mondeville had taught the dry or aseptic wound treatment, it had been opposed by the learned Guy de Chauliac and all the surgeons after him, with the exception of Paracelsus, and eventually of Felix Würtz. Early in his army career, while surgeon to Colonel General de Montejan, on the expedition of Francis I to Turin (1536-7), Paré had a lesson in wound treatment that was destined to make history. Hear his own story:

"Now I was at this time a fresh-water soldier; I had not yet seen wounds made by gunshot at the first dressing. It is true I had read in John de Vigo, first Book, *Of Wounds in General*, eighth chapter, that wounds made by firearms partake of venosity, by reason of the powder; and for their cure he bids you cauterise them with oil of elders scalding hot, mixed with a little treacle. And to make no mistake, before I would use the said oil, knowing this was to bring great pain to the patient, I asked first before I applied it, what the other surgeons did for the first dressing; which was to put the said oil, boiling well, into the wounds, with tents and setons; wherefore I took courage to do as they did. At last my oil ran short, and I was forced instead thereof to apply a digestive made of the yolks of eggs, oil of roses, and turpentine. In the night I could not sleep in quiet, fearing some default in not cauterising, that I should find the wounded to whom I had not used the said oil dead from the poison of their wounds; which made me rise very early to visit them, where beyond my expectation I found that those to whom I had applied my digestive medicament had but little pain, and their wounds without inflammation or swelling, having rested fairly well that night; the others, to whom the boiling oil was used, I found feverish, with great pain and swelling about the edges of their wounds. Then I resolved never more to burn thus cruelly poor men with gunshot wounds.

"While I was at Turin, I found a surgeon famed above all others for his treatment of gunshot wounds; into whose favor I found means to insinuate myself, to have the recipe of his balm, as he called it, wherewith he dressed gunshot wounds. And he made me pay my court to him for two years, before I could possibly draw the recipe from him. In the end, thanks to my gifts and presents, he gave it to me; which was to boil, in oil of lilies, young whelps just born, and earth-worms prepared with Venetian turpentine. Then I was joyful, and my heart made glad, that I had understood his remedy, which was like that which I had obtained by chance.

"See how I learned to treat gunshot wounds; not by books."<sup>22</sup>

While much fun has been poked at this oil-of-puppy dressing, and Paré never attained to the clear surgical vision of Hugh, Theodoric, and

<sup>22</sup> From "The Journey to Turin in 1536" in *Paré's Apologie et Voyages*; translated by Stephen Paget in his *Ambroise Paré*, New York, 1897, 33-35, and by F. R. Packard in his "Life and Times of Ambroise Paré," New York, 1921, 162-164.

Henri, the important thing is, as Allbutt says that "from this time the receptive mind of Paré perceived venom and burn were figments both and that a gunshot wound was just a contusion or comminution like another."<sup>26</sup> The most frequent response in his litany: "I dressed him; God healed him," and his straightforward utterances elsewhere, reveal the forward trend of his independent thought toward the experimental or Hunterian ideal:

"We should not fall asleep over the labor of the ancients, as if they knew or said everything."

"You will have to render account not to the ancients but to God for your humanity and skill."

Again, Paré's application of the ligature of blood vessels to amputations was only part of his earnest desire to become a "*parfait practisour*" and to get away from the barbarous Arabian practice of cauterizing bleeding wounds to stanch hemorrhage. There was nothing new in the ligature. It was known to Celsus<sup>27</sup> and Archigenes as a commonplace procedure in wound surgery, as well as to Roger, Roland and Yperman. Paré himself wrongly attributes it to Galen, and his own method was not a true but an indirect ligation, the *ligature en masse*, including some of the tissues around the vessel and occasioning pain and inconvenience to the patient. But "until the time of Paré, the surgeons, for very intelligible reasons, shirked the larger amputations" (Allbutt).<sup>28</sup> His work was forward-looking and forward-moving, and his standard was already planted in the new territory.

The example of Paré was followed by the Italian surgeon Bartholommeo Maggi (1516-52), whose treatise on gunshot wounds was published in the year of his death (1552) and contemporaneously with that of Ferri. He held that gunshot wounds are neither scorched nor poisoned, made experiments to ascertain the heat of firing in a projectile, substituted a milder method of promoting suppuration for Vigo's drastic treatment, which he condemned, and recommended the earliest possible removal of the bullet. Leonardo Botallo (1530), physician to Charles IX of France, in his treatise on gunshot wounds (1560), opposed the practice of Vigo and Ferri, regarded such lesions as contused wounds, which were too zealously explored, sounded, dilated and enlarged. He condemned reckless dilation and in extraction, used curved sounds and shortened forceps. He preferred escharotics and the cautery for haemostasis, however, and was a veritable vampire of venesection, a pitiless bloodletter in all chronic diseases.

High in the annals of Renaissance surgery and well-beloved of medical men is the name of the Swiss army surgeon, Felix Würtz (1518-75), a follower of Paracelsus in simple-wound treatment. He was only

<sup>26</sup> Allbutt: *op. cit.*, 83.

<sup>27</sup> "But if these remedies are also ineffectual in restraining the haemorrhage the bleeding vessels are to be taken up, and two ligatures to be applied, one on each side of the wound, and then (the vessels) are to be divided between the ligatures, that they may both unite together, by anastomosing branches and effect an obliteration of their orifices. Celsus: *De re medica*, V, 26 §21, cited by Allbutt.

<sup>28</sup> Allbutt: *op. cit.*, 82.

a wound surgeon, had no book-learning, wrote in the vernacular, and never essayed the major operations. He stood for laudable pus and the belief in suppuration as a cleanser of wounds, but none wrote with more fiery eloquence, in aid of clean hands and against the meddlesome probes, plasters, salves, poultices, tents, setons and general fingering of open wounds. In the surgical treatise of Würtz (1563) is a little pediatric tract, easily the best of the time, which is the first brief for infantile surgery and orthopedies. When he lifts his voice against the deformation of infants by tight swaddling and rough handling, we sense the larger humanity of the Renaissance. "His heart beats so high that the thumping against his leathern coat is audible across the centuries."<sup>29</sup>

The great Provencal surgeon Pierre Franco (1503- ), driven into Switzerland by the Waldensian massacres, was, like Paré and Würtz, a self-educated barber, and was thus, as Allbutt says, "spared the misfortune of a speculative intellect." He was a bolder and better operator than Paré, and by his improvements in the technique of herniotomy, lithotomy, eye surgery and plastic surgery, took these procedures out of the hands of the strolling incisors and added new territory to the domain of legitimate surgery. He had been slightly treated by Haeser and Gurlt, but the right judgment is that of Malgaigne—"ce beau génie chirurgicale" and of Nicaise: "no surgeon made such discoveries as Franco; for hernia, stone and cataract he did more than Paré."<sup>30</sup>

It remains to give some brief account of the great pathbreakers of Renaissance medicine, three shaggy, assertive figures to whom our profession owes much of the social position and intellectual liberty it now possesses.

### *Paracelsus*

Aureolus Paracelsus (1493-1541), of Einsiedeln, Switzerland, a student of Leonicensis at Ferrara (1515), began his lectures at Basel in 1527 by throwing the works of Galen and Avicenna into a bonfire. Of the astrological medicine of his time, he said: "I will throw your horoscopic prognostications into Lake Pilatus." He was the essential reformer of Renaissance medicine, aptly styled *Luther medicorum*. He was rough of speech, coarse in invective, obscure in thought and expression, but with such rapid flashes of insight as only true genius has, and popular as no other physician before him—the people's physician *par excellence*.

Paracelsus was the founder of chemotherapy, taught that medicine and surgery are one (*cinerley*), stood for rational wound-treatment, opposed witchcraft, stargraft and

<sup>29</sup> R. W. Emerson

<sup>30</sup> Cited by Allbutt

promanacy, was the first to analyze mineral waters and made real additions to the pharmacopœia. He was the first to write on miners' diseases, described miner's phthisis and the effects of choke damp, saw gout and stone as diathetic diseases, and noted the correlation between goitre and myxoedema. His motto was: Experimentation controlled by the authoritative literature"<sup>31</sup>—a truly modern note.

### Vesalius

Andreas Vesalius (1514-64), born in Brussels, sometime a military surgeon in the armies of Charles V, was the founder of modern anatomy, which he first taught locally by public dissection, demonstrating to all and sundry such knowledge of the structure of the human body as had never been seen before; and then *urbi et orbe*, in his epoch-making treatise, the *Fabrica* (1543), with illustrations only bettered in their time by the unapproachable drawings of Leonardo da Vinci. This book obliterated the older Galenic anatomy of apes and swine and was imitated and improved upon for centuries. In the copy of the *Fabrica* in the New York Academy of Medicine, Dr. Osler wrote: "The greatest book ever printed, from which modern medicine dates." Vesalius did the only physiological experiments between Galen and Harvey, was a pioneer in craniology and comparative psychology, and an admirable clinician and pathologist. While on duty with Charles V, he was the first to describe aneurism of the thoracic and abdominal aorta (1555),<sup>32</sup> the most important landmark in the history of the condition between Galen and Paré.

### Ambroise Paré (1510-90)

He was born in the little village of Bourg Hersent (Maine) and lived to the age of 90, his lifetime covering the better part of his century, from Flodden Field to the Armada, from Luther at Worms to the battle of Ivry. He lived through the reigns of seven French monarchs and of three Holy Roman Emperors (Maximilian, Charles V, and Philip II). Through this long life he managed to remain honest, firm, upright, humane and essentially sweet-tempered to the end, steering clear, as an impersonal physician and soldier,<sup>33</sup> from the intrigues of courts and the fanatical hatreds of religious sects. Although probably a Huguenot, his life was saved by the king at St. Bartholomew, and four months before his death we find him pleading successfully with the Archbishop of Lyon for the welfare of the besieged people of Paris. He invented many surgical instruments, introduced artificial limbs and eyes, the

<sup>31</sup> "Experimenta ac ratio auctorum loco mihi suffragantur." Cited by Sudhoff.

<sup>32</sup> For an account of which, see: A. N. Tucker: *Mil. Surgeon*, Wash., 1922, I, 333-342.

<sup>33</sup> That Paré was treated as the equivalent of an officer in campaign is evident from the manner in which he was consulted by monarchs and commanders in regard to military operations, e.g., at the defense of Hesdin (1553).

truss and implantation of the teeth, reintroduced massage and podalic version, described pyæmia, the effects of prostatic hypertrophy and fracture of the neck of the femur; saw flies as possible carriers of wound-infection and was the first to suggest the syphilitic origin of aneurism. But these are only details that went to the making of a great all-round surgeon. His collective works, the apple of his eye, are a curious mixture of sound sense and surgical genius with a specious parade of scholarship which may be charged up to the mysterious *pion* who probably embellished his writings for him.<sup>34</sup> For this Paré was persecuted by a bigot of the Paris Faculty, who wanted to stop the publication of his book, but serene in the support and countenance of the king, he flaps his adversary with bladders as *mon petit maistre* and, with the urbanity of his race, admonishes him to "quit his animosities and treat more kindly *le bon vieillard*." This phrase goes to the very heart of the matter. Paré is the greatest of military surgeons, just as Larrey and Letterman are in a manner the greatest of medical officers, through his ability, his large humanity and insight. Read his *Apologia et Voyages* and you will see for the first time in military history a medical vassal of great captains going out of his way to succor the ordinary wounded soldier, as at Perpignan (1543) or Boulogne (1545) or on the march through Germany (1552). Early in his career, at Turin (1536), Paré had seen an old sergeant cut the throats of three helpless wounded men, "gently and without malice," to put them out of misery. The episode appears to have affected him as profoundly as the boiling oil and red hot irons applied to wounds. The age in which he lived was one in which extravagant generosity touched hands with incredible meanness and jocund brutality. Courts assemble to view the *autos-de-fé*. High-born ladies laughingly inspect the corpses after St. Bartholomew for a reason not mentionable to ears polite. The brave Servetus is tortured to death in flaming fire for a quibble about theological verbiage, while the crowd looks on, in sheep-like docility and gives no sign. The type is that of Hewlett's Bothwell, leaning over the ship's taffrail and bawling at the perishing sailors: "Sooner you than me, you drowning swine!" In the bloody period in which he lived, a period in which people were less sensitive about murder and adultery than about differences

<sup>34</sup> No reflection is cast upon Paré in this assertion. In the period following the Revival of Learning, allusions to the Greek and Roman writers were as much in everybody's mouth as our small talk about classical music after symphony concerts, and Paré's actual knowledge of ancient medicine was, in his long life, as real and effective as Shakespeare's or Beethoven's knowledge of Plutarch's Lives. But it was the fashion of his time to stuff medical treatises with a footless show of erudition and he followed the line of least resistance. The apparent swagger in his writings is the expansive self assertion of the Renaissance people, which we find alike in Luther, Knox, Vesalius, Paracelsus, Brantôme, the Elizabethan dramatists and even Montaigne.



in religious beliefs, the same, human figure of Paré towers above his time and environment like some great seamark in an ocean storm.

In the words of Streeter:

"Quiet sessions with Paré leave us with the inevitable conviction that the ultimate ground for the safety and permanence of our human world lies in character—the character of plain, brave men like Paré. Our rogueries, frauds, cozens and delays cannot cover the fact that the central glory of the universe is character. Now, may we ask, what is the rôle of character in the art and mystery of medicine? What it has always been—that which redeems from decay."

*(To be continued)*



# FIRST DETERMINATION OF AORTIC ANEURISM IN THE LIVING SUBJECT BY A MILITARY SURGEON

By ARTHUR N. TASKER

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TO HAVE been the first of all human kind to accomplish some new thing is in itself a mortgage on the attention of posterity. In the cases of most men who thus tread unbeaten paths, their internal secretions are of such order as to make them not content with one achievement alone, — even though it be epoch-making; their lives are usually full from end to end of activities which escape the routine that hedges their fellows about, and which by that token make them continuously conspicuous in their own time and render their names known to the fame of the future.

It was Brussels, then capital of the old Duchy of Brabant, that saw on December 31, 1514, the earthly advent of Andreas Vesalius, whose star, as he came into the world, predestined him to turn anatomical study away from its blind following of the old Galenic tradition into the paths of individual research, and thus to become, "the founder of descriptive, systematic anatomy." This youth, imbued with a burning thirst for knowledge and with the true spirit of "philosophia," which seeks only to know the truth in all its exactness, first acquired at the University of Louvain the ordinary classical attainments of his day, and then, at the age of fourteen, began the study of anatomy in Paris under Dubois (otherwise known according to the Latin tendency of his time as Jacobus Sylvius). French scientific thought of that period gave itself up to extravagant admiration of antiquity, and all anatomical teaching followed blindly the writings of Galen. These two circumstances were extremely unfavorable to scientific advance. Vesalius, original of mind, though he did not underrate the Galenic anatomy, nevertheless ultimately saw that it was really the anatomy of the lower animals, and was in time led to abandon the instruction of Sylvius and to seek more directly by dissection and study of the cadaver a knowledge of human anatomy. But this course was beset with many hazards in France, and thinking to find in Italy a broader liberalism he betook himself thither, probably in the year 1536. In that country he prepared his monumental work "De Humani Corporis Fabrica Libri Septem," which, with an epitome thereto, was published in 1543, when its author, already widely and justly famous, was but twenty-eight years of age. Of this treatise, which has been the object of so much vituperative criticism from the day of its appearance down almost to

our own times, Garrison says in his essay "In defense of Vesalius" that "we must judge the *Fabrica* not by its faded pages and the scholastic flavor of its text, but in the spirit of the poet's words: 'Camerado, this is no book! Who touches this touches a man!'"<sup>1</sup> During these Italian years, Vesalius taught his chosen subject at Padua, Bologna, and Pisa through the medium of demonstrations in practical anatomy. These sessions were attended by hundreds, and to them admission was sought, not only by physicians and students of medicine, but by the learned members of other professions as well. He thus became the first of an illustrious line of teachers who during the 16th century raised to the highest eminence the anatomical reputation of Italy.

Shortly after the appearance of the "*Fabrica*" in its first edition—probably about 1513 or 1514—we see Vesalius summoned by Charles V to become his imperial physician, and most of the remainder of his life was passed at the Spanish court in this capacity.<sup>2</sup> This appointment made him *ipso facto* a military surgeon in the armies of Charles V and Philip II (1544-1564), for all physicians attached to the persons of monarchs and nobles occupied in relation to their patrons a position of military vassalage—albeit one of fairly high standing, particularly at the Spanish court. His duties in this new capacity brought about the presence of Vesalius at the siege in 1544 of Boulogne-sur-Mer by the combined English and Spanish forces. It is an interesting bit of medical history that this military occasion brought together a constellation of the most renowned military surgeons of their time,—namely, Paré, who was attached to the French troops in the beleaguered city, Thomas Gale of the English army of Henry VIII, and Daza Chacon and Vesalius who were both on duty with the imperial forces of Charles V.<sup>3</sup> In all likelihood, again, Vesalius must have seen, at least discontinuously, the siege of Metz (1552) where a small defending force held in check one of the mightiest armies that had ever up to that time been gathered together. In this campaign, Metz might very probably have fallen before the Spanish investment, had not starvation and intense cold compelled the abandonment of the siege after a duration of sixty-five days.

The activities of Vesalius during this military period of his career proclaimed him a great clinician as well as a superlative scientific anatomist. His services as consultant were widely sought, and in 1555, being sent for to give the benefit of his professional skill to one Leonard Velser, a nobleman of Angsburg, he diagnosed as aortic aneurism a pulsating tumor found in the region of the back. He described the

<sup>1</sup> F. H. Garrison: *Bull. Soc. Med. Hist.*, Chicago, 1916, 65.

<sup>2</sup> M. Roth: *Andreas Vesalius Bruxellensis*, Berlin, 1892, 192-278.

<sup>3</sup> C. Brunner: *Die Verwundeten in der Kriegen der alten Eidgenossenschaft*, Tübingen, 1901, p. 20.

condition to Velser's attending physicians and pronounced it incurable. Aneurism, both internal and external, was not unknown before this time. Strangely enough there seems to have been no mention of the condition in the writings of Hippocrates—which was unusual for Hippocrates. Galen, however, was familiar with the disease and described at least two varieties of external aneurism, while Antyllos in the first century of this era operated brilliantly on external aneurism; but only small knowledge had been acquired regarding internal—and especially aortic—aneurism before the 16th century. Paré, a contemporary of Vesalius and a French military surgeon, was probably the first to recognize the syphilitic origin of aneurism.<sup>4</sup> The diagnosis made in the case of Velser, then, was the first determination of aortic aneurism ever made on the living subject; furthermore, this diagnosis was two years later confirmed at autopsy—by no means a universal occurrence even today when clinical conclusions and autopsy findings are compared. Very complete notes of the necropsy were taken by Achilles Gasser and sent to Vesalius who, in his acknowledgment of their receipt, showed a really profound clinical and anatomical knowledge of the malady under discussion. Under date of July 18, 1557, John Rumler, a grandson of Gasser, prepared a report of this autopsy, which in 1667 was printed in the degenerated Latin of the time as part of a volume entitled "*Observationes medicæ*" and edited by George Hieronymus Velschius at Augsburg. In free translation, Rumler's report<sup>5</sup> runs somewhat as follows:

When in 1557 Leonard Velser, a nobleman, who had been ill for a long time with a malady presenting various manifestations, finally died as the result of an internal aneurism, the body of the deceased was autopsied on the 25th of June by Junius Adolph Oeco (father and son), Ambrose Jung, and Lucas Stengel, physicians of Augsburg. The results of this autopsy were reported to Vesalius by Achilles Gasser, my maternal grandfather, as follows:

The abdomen being opened in the usual manner, the contained viscera themselves appeared essentially normal. The stomach and intestines showed no lesion; the liver was large and free from disease, the vena cava was much larger than we have ever seen it at other autopsies, and was ruptured at the site of the aneurism. The spleen was moderately short, presented whitish patches on its external surface, and appeared partially decomposed. The kidneys were normal. The heart was large, completely filled with blood, and apparently normal. The aorta presented a considerable dilatation equal in diameter to the width of the palm of a hand, and this portion was so adherent to the ribs and dorsal vertebrae that it could not be separated from them without tearing. When this aneurismal tumor had been torn away, there exuded from it a thin red blood (such as arterial blood usually is) which had been contained in a mass made up of blood clot or of some fleshy substance destitute of muscular fibres. Surrounding this mass in turn was a layer of hard, whitish substance, of the thickness of a finger and of the color and general appearance of boiled fat of swine. The aneurismal mass with its contents

<sup>4</sup> See Osler in *Syst. Med.* (Allbutt), Lond., 1909, vi, 620-623.

<sup>5</sup> In: G. H. Velschius; *Sylloge*, Augsburg, 1667, pt. 4 (Rumler), 46-47.

approached in size the fist of an average man or the egg of an ostrich. The ribs at the site of the aneurism were as if carious; one was completely broken and fragmented, resulting undoubtedly from the excessive pressure to which it had been subjected. Likewise the dorsal vertebrae where they were in contact with the aneurism above the diaphragm were spongy and so eroded that the end of the little finger could be inserted into any one of them, provided one were willing to disregard the peculiar odor. There was no lesion of the lungs, although the sick man spat up a copious amount of blood before his death, so that it seemed to those in attendance that he was suffocated by this same blood. Externally where the tumor and pulsation were to be seen during life, the skin of the back became after death livid and suffused with blood like that of men who have been beaten. This is a diligent report of the findings observed at autopsy, omitting those other signs upon which a diagnosis of the condition was originally made.

When Andreas Vesalius had received this report he replied to Gasser as follows:

I have received your letter, my most learned friend, Achilles, in which you describe so carefully the condition of the deceased Leonardus as observed by you at autopsy, together with one from Bartholomaeus Velser. I thank you very earnestly for this information, for I recognize very clearly and definitely upon how wide a variety of conjectures we are compelled to make our diagnoses in cases of disease. It is indeed remarkable how much more frequently an arterial dilatation of this sort may be composed of material contained in the blood than is the case when the artery departs [from the normal] in any other manner. For that which you compare to fat in the case of his lordship, I have looked upon as being quite similar to the vitreous humor of the eye; while at times I have found only a flesh-like substance corresponding in its superficial position to the internal surface of the ventricles of the heart. A sister of the Bishop of Arras has a similar mass in the anterior portion of the abdominal cavity below the stomach, which is so movable that one would say it were a ball placed now on the right side and now on the left, accordingly as she lies on this or that side. This condition has been recognized by her for many years, even from her earliest youth, and her mother writes that she herself had noticed the affection in its early stages.\* At present its diagnosis depends upon the pulsation (pulsu). If, then, we so frequently discover this concealed condition in the living body, how often may it be present in the brain and thorax or in the region of the sacrum, and thus escape our attention? May I perish if, since seeing the case of Leonardus, I have not met with at least six other cases of the same malady involving different parts of the body. The first case of this sort that I ever saw, as I have also told T., was in the thoracic cavity near the collar bone. This aneurism had eroded the upper thoracic ribs, just as in the case of Leonardus you describe the gradual erosion of the ribs and transverse processes of the vertebrae rather than their involvement with caries or decay.

Brussels, July 18, 1557.

#### NOTE

A similar case has been reported by Antonius Saporta in Book I, Chapter 43, of his work "Concerning Tumors." That which our friend, Adolphus Oeco, formerly wrote of fully on the same subject to J. Shen (Book V, Observation 227) may also be consulted.

The world's greatest thinkers and investigators—and more particularly those who have sought to elucidate the mysteries of the human body—always in advance of their times, have all too often been finally the victims of popular prejudice. So it was with Vesalius. His fate

\* The excessive mobility of this mass, its early appearance (ab incunte aetate), and its long persistence (annis plurimis) without destroying life, all suggest the possibility that in this case a pedunculated tumor may have been mistaken for an aneurism.

illustrates as well as any other single instance the essential barbarism of the period in which he lived. It is reported that Vesalius was performing an autopsy on the body of a Spanish nobleman—with the consent of the latter's kinsmen—when, as not infrequently occurs, a slow contraction of the heart muscle was observed to take place as that organ was being sectioned. This circumstance gave to the enemies of the great physician an opportunity to arouse popular passion against him, and Vesalius was charged with murder and heresy. He is said to have been condemned to death, but through the influence of his imperial patron the sentence was vacated upon his promise to make a pilgrimage to the Holy Land. Scarcely had he arrived at Jerusalem when there came to him from the Senate of Venice an invitation to accept a professorship at Padua. On his return voyage to Italy, however, in 1565, he was shipwrecked on the Island of Zante, and shortly thereafter died in circumstances of such penury that only the charity of a wealthy islander secured for his remains a Christian burial.<sup>7</sup>

<sup>7</sup> M. Roth: *Op. cit.*, 274-275.



# SOMETHING ABOUT THE SO-CALLED DEADLY BULLET<sup>1</sup>

BY MAJOR ROMULUS A. FOSTER

*Medical Corps, D. C. National Guard, Retired*

[In comparing this paper with that written by Colonel Louis B. Wilson, M. C., U. S. A., and published in the September, 1921, issue of THE MILITARY SURGEON, it will be very apparent as to what progress has been made in the question of projectiles and of the scientific tests as to their action. THE EDITOR.]

UNTIL I had examined the statistics on the subject, I firmly believed that every shot fired from a small arm—that is, from a rifle, carbine, or revolver—during a battle, either killed or wounded a soldier. I was therefore very much astonished when I learned that with even the new magazine rifle it requires, on an average, 400 shots to make one hit. At Mars la Tour the Germans made 1 hit in 452 shots. As the number of cartridges carried by a soldier in the United States is 100, it would therefore require all the ammunition of four soldiers to kill or wound one of the enemy.

I also believed that the military surgeon on the battlefield would be employed most of the time in ligating arteries severed by bullets, fragments of shells, etc. To show how much I was mistaken in this belief, I have only to quote the following:

Experiments on the cadaver afford very uncertain evidence as to the probable amount of hemorrhage to be expected from wounds with the small-caliber rifle. Nevertheless, experience thus far obtained from recorded cases in living subjects tends to show that the old saying, "Gunshot wounds do not bleed," has been but little affected by the recent change in weapons. In past wars an average of about 1 per cent of those wounded in battle have come under treatment with serious injury to blood-vessels; but, considering the smaller caliber and fewer complications from lodgment and deformity with the new bullet, in future this percentage should be reduced. . . . When a vessel of large size is opened, fatal hemorrhage usually follows before any surgical aid is available; while smaller ones generally close spontaneously from contraction and coagulation which light compression favors. All wounds bleed more or less for a time, but primary hemorrhage of a grave character will, no doubt, continue to be rare among those who come under treatment on the battlefield. (Forwood.)

The rifle bullet that has been adopted by all armies is of small caliber. In the United States the Regular Army and the National Guard use identically the same kind—that is, the caliber .30 bullet, which is a trifle less than one-third of an inch in diameter. The new rifle bullet—that is, the one used by the U. S. Army and the National Guard—

<sup>1</sup>Read before one of the Maryland literary societies several years before the World War.

weighs 220 grains and is cylindrical in form. It has a core, which is composed of 1 part of tin and 25 parts of lead. The core is covered or jacketed with cupro-nickel steel. The core of hard lead gives the bullet weight, and the cupro-nickel covering increases its firmness and makes it take the grooves of the rifle. The smokeless powder used to propel it from the rifle is of the nitro-cellulose type, and the charge thereof varies from 35 to 42 grains.

Just here it should be stated that there are three principal kinds of smokeless powder. One kind is obtained from the action of nitric acid on vegetable fiber; another kind, from the action of nitric acid on glycerine; and a third is a mixture of nitric acid and phenol. The powerful explosives thus derived are manipulated or modified in such a manner as to render them perfectly safe for military purposes. The weight of the small-caliber ball cartridge complete, which includes the case, bullet, primer and charge of smokeless powder, varies from 435 to 442 grains, and has a muzzle velocity of 2,000 feet per second.

In regard to the general character of wounds inflicted by the small-caliber bullet, a military surgeon of considerable experience has this to say:

In the soft parts, including muscular and fibrous structures generally, skin, blood-vessels, nerves, lung tissue, and also in the thin parts of bone, the small-caliber bullet, in direct shot, at all ranges up to about 2,000 meters, makes a nearly clean perforation without lodgment or deformity. The openings of entrance and exit are similar, and vary but little from the diameter of the bullet, which passes in a direct line between these two points. The punched-out appearance often described in such wounds is well marked in dead bodies, where no contraction or movement succeeds to destroy the similarity; but in living tissue it is not so apparent. The substance which occupied the bullet's course remains behind, reduced to pulp or fine particles.

The tract widens a little toward the middle in long wounds through soft tissue, especially under high velocity; but allowing for muscular contractions and changes of position, its walls are comparatively smooth, with very little laceration. The conditions are favorable to healing, though also perhaps somewhat more favorable to hemorrhage than with the old lead bullet. Fasciæ are punched; tendons and aponeuroses may be punched or slit. Blood-vessels and nerves are often only partially divided, more rarely perforated, but never escape by being pushed aside. The chances of complication from injury to important vessels and nerves are, however, much diminished by the small diameter of the new bullet.

The wound of entrance through the skin is usually round, with rather smooth, depressed margins, and often 1 or 2 millimeters smaller—rarely larger—than the caliber of the bullet, or when the surface is struck obliquely it varies to oval or elongated ovoid. The narrow border of brown discoloration which, after a time, often appears around



the wound-margins, results from detachment of the cuticle and subsequent congestion or drying of the denuded surface. The wound of exit averages a little larger than that of entrance, and as there is no support against the skin while it is being pushed outward, it gives way under tension. Thus these openings are more irregular, with ragged, everted margins, sometimes being mere stellate or even linear slits, which readily close and might be difficult to find. The diameter of the openings of entrance and exit in the skin, as well as that in the wound canal, is influenced to some extent by the velocity of the bullet, being greater at close range, and averaging a little less as the distance increases. The least amount of lateral action of the bullet is found in perforations through healthy inflated lung, where the wound canal is very minute, when there is no complication from fragments of a splintered rib.

This class of injuries, occurring at all distances, supplemented by those in other tissues, especially in the spongy portions of bones, which appear at the longer ranges, constitute a large percentage of the wounds of war. They are among the most favorable for treatment with which the surgeon has to deal, and more so with the new than with the old bullet. The small openings, which tend to close, offer protection against infection, and under simple aseptic dressings they are disposed to heal almost as readily as subcutaneous injuries. The regions of greatest danger are about the neck, axilla and femoral vessels, where, from hemorrhage or wounds of the trachea and other organs, serious complications may arise. The clean perforating qualities of the small-caliber bullet as compared with the well-known lacerating effects of the old lead bullet in passing through important structures was illustrated in the recent war with Spain by many remarkable wounds through the neck and body in various directions, and from which the soldiers recovered without any very serious consequences.

The lateral action of the bullet's energy incidentally referred to above is generally called the "explosive effect." As it is a factor of the highest importance in gunshot injuries, it has been the subject of much discussion since the introduction of high-power rifles and has led to many interesting experiments. At one of the annual conventions of the Association of Military Surgeons of the United States it was the subject that received the most attention. The Surgeon General of the Army, who, by the way, is a member of the association named, has, in my opinion, given the most lucid, as well as scientific, explanation of the explosive effect of the small-caliber rifle bullet. He says:

It is clear that the so-called explosive action of the modern rifle-bullet, observed in certain tissues and under certain conditions, results from lateral transmission of the bullet's energy to parts immediately about the point of impact, and through them to other parts beyond. The occurrence of explosive effect in a wound depends upon the quality of the tissues for transmitting the bullet's energy. In the case of resisting bone it takes place through broken fragments, which are thrown with more or less violence into the surrounding parts. In

liquids and in tissues saturated with them, it is transmitted from particle to particle of the liquid, and exerted in all directions against resisting boundaries, as the skull, walls of hollow viscera, and the capsules of large glandular organs. The incompressibility of watery fluid and the free mobility of its particles make it an excellent medium for the transmission of force. In soft wood, sponge, or inflated lung, on the contrary, the conditions are not favorable to the transmission of the bullet's energy, which, for lack of resistance, is expended in slight compression along the line of penetration. Similar conditions exist in fat, muscular, and fibrous structures, and in spongy bones. In passing through elastic bodies the bullet exerts its energy against the sides of the opening, which distend; but if the coefficient of elasticity be not overcome, they close again, leaving a small defect at the point of impact. Thus wound-openings in the skin are often smaller than the caliber of the missile, especially in the axilla, behind the knee, and at other points where the skin is most elastic, and when the elasticity is overcome under tension, they are usually simple linear or radiating slits. . . . The greater size and weight of the old lead bullet and the higher velocity of the new one are about in compensating relation for close range, so that up to 150 or 200 meters these two missiles produce very much the same explosive effect. Beyond this, the former, with its constant tendency to deformities, has a markedly greater lacerating effect, while the great stability, small size, and swift motion of the latter bring its peculiar penetrating qualities into prominence. At 500 to 1,000 meters the lead bullet still has a very damaging effect on bone, but it deforms and often lodges, while the small one, even when broken, usually passes through and out of the wound, if no intervening object has been struck to deflect its course or reduce its velocity.

The following experiments fully illustrated the explosive effect of the small-caliber bullet.

On firing through a skull from which the brain had been removed, a clean perforation was made. On firing through a skull from which the brain had not been removed, the skull was extensively ruptured, the brain more or less disorganized, and large pieces of the cranial vault even thrown out through the torn scalp to a distance of several yards, as though an explosion had occurred within.

A small-caliber rifle bullet was fired directly downward into the center of an open barrel of 60-gallon capacity, filled with water. The staves were  $\frac{3}{4}$ -inch oak, bound by six iron hoops. Following was the result: Several gallons of water were thrown upward into the air, two of the iron hoops were ruptured, and a piece of stave 15 inches long was broken out from the middle of the cask, and other staves were fractured.

Many believe that the percentage of killed and wounded, as well as the ratio of mortality, will be greatly increased in future wars on account of the recent improvements in military weapons. Statistical records, however, would seem to indicate that there will be a constant tendency

in the opposite direction; that as the efficiency of weapons increases, the percentage of wounded and the ratio of mortality will decrease. In discussing this point, Von Coler concludes:

Neither past experience nor theoretical considerations afford any sufficient basis for the supposition that the total losses in a future war will exceed former percentages so very much, as most military surgeons now seem to believe. The ratio of killed to wounded on future battle-fields will depend upon the distance at which the principal fighting takes place. Up to 600 meters the number of killed will fall very little short of the number wounded, while beyond 1,000 meters the latter will greatly exceed the former.

Another authority says:

The casualties of battle are influenced by prevailing circumstances, such as the nature of the ground—whether favorable for shelter or open; the character of the operations—whether offensive or defensive, field or siege; the number of troops engaged and the tactical skill with which they are maneuvered; the duration of the engagement; the distance between contending lines; the state of discipline among the men, defeat or victory, facilities for handling the wounded on the field, and the provision available for their care and treatment.



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## EDITORIAL

### BULLY FOR THE QUARTERMASTER CORPS!!!

We of the Federal Services have for some time past felt somewhat in the position of the mean man who was being buried. One of his neighbors was asked to say a word in his commendation and after protracted thought he committed himself as follows: "Well, there were a few times in his life when he was not so mean as he was most of the time."

#### RUDOLPH PRAISES ARMY REGULARS

"The people of the United States ought to be proud of their Army," said District Commissioner Rudolph today, referring to the prompt and efficient service rendered by the regular soldiers stationed in this vicinity at the Knickerbocker Theater catastrophe.

"Every citizen of the District of Columbia," said Mr. Rudolph, "owes a debt of gratitude to the Army for the prompt, workmanlike and unselfish manner in which it responded to the call for help during the Knickerbocker Theater disaster—a debt which our people can never repay.

"The Army furnished hundreds of willing hands and provided the tools with which they worked to rescue with all possible speed the scores of dead and dying victims trapped in the mass of snow-covered wreckage. Just as the Army answered after the Johnstown flood, the Galveston disaster, the San Francisco fire, the floods of Dayton and Pueblo, and in the recent West Virginia mine disorders, so its men came to the rescue when Washington needed help the most. It has been reported to me

that the first acetylene torch and the gas to work it, the first jacks, picks and shovels, were all rushed to the scene of suffering in Quartermaster Corps trucks by quartermaster men. It is abundant proof that our Army has its mission in peace as well as in war, and the nation can count on it in the future as it has in the past. I thank God that the regulars were as close at hand when they were so urgently needed in the nation's capital."

General Bandholtz, commanding the district of Washington, has written a letter to Maj. Gen. H. L. Rogers, the quartermaster general, concerning the work of the Quartermaster Corps, in which he says:

"Every officer of your corps on duty with this command responded immediately and effectively, and the services of all of them, as well as their personnel, is deserving of the highest praise. They worked untiringly during the thirty-six hours of relief work, and their prompt assistance was the direct cause for the saving of many lives. It must be to you a cause of much gratification that all of the members of your corps upheld in such a fine manner the traditions of the United States Army."

The above, clipped from the *Washington Star*, February 3, 1922, is evidence that the general public is ready to make the same allowance for us. It was a fine piece of work and we congratulate the Q. M. C. for it most heartily. They are our good friends, and in all emergencies, war included, play Moses to our Aaron in the matter of holding up hands.

We came down from Walter Reed Hospital as soon as we could and did what we could. We also came out of the offices where we practiced medicine in civil capacity and worked earnestly and well; we opened our drug stores and gave without stint. We all turned in, shoulder to shoulder, to drag from twisted iron and broken concrete the poor wretches who were prisoned there in that black horror.

It seems rather satisfactory that we did it as common humans; that there was no contention that any of us was different because he had on a uniform or did not have one on. It is a good thing to realize that after all, "Judy O'Grady and the Colonel's lady are sisters under their skins." Let's try and remember that and keep pretty close together and not lose sight ever of the fact that we are all of us, every last one, "Americans," common people of the United States and that we have a very real cause for mutual esteem and mutual pride.

JAMES ROBB CHURCH.

### THE QUESTION OF ETHICS

The medical profession is definitely hedged by plain regulations in respect to what constitutes and what does not constitute ethical conduct for those who are practitioners of this science. Probably what is most transgressed is the rule regarding advertisement. The frank quack who is altogether a free lance, who owes no allegiance to anything save his own advancement, is delightfully free in the matter of extolling his own learning and casting broadcast statements of his own skill, of the efficacy of his methods. With him we are not particularly concerned, save as an objectionable cinder in the public eye which it would be well to remove for the sake of a clearer national vision. The editor has wondered lately as to whether the orthodox physicians throughout the country are as careful in regarding this ordinance as they might be. In the review of medical journals which come to the office on the exchange list, we have noted several times of late query along this line. One publication suggested, with what seemed to us good ground, that there is too much tendency to allow comment on personal prowess to appear in the public print, recital of successful operation, of satisfactory cures of strange maladies. It is hardly probable that these accounts would find publication without consent of the interested physician.

There is little excuse for writings of this sort unless they concern some personage of national importance, when we wish to have all the knowledge which it is proper to impart. The complications of John Doe and Richard Roe have found sufficient publicity when they have been reported to city or county medical societies and published in some technical journal devoted to the interest of medicine or surgery. A garbled recital blended with a eulogium of Doctor So-and-So, written by a layman in unscientific terms for the benefit of a public which is interested only in the sensational side, must smack more of personal advertisement than of proper spreading of scientific facts.

It seems to us that a case very much in point is that of a certain very famous orthopedist who has recently revisited our country to give demonstrations of his technique in the correction of certain physical defects. The press stated that his reasons for this visit were an expression of his gratitude for aid extended by this nation to his countrymen in time of want. Statement is also made that the necessity for his visit and his services was somewhat problematic, since his method was fully demonstrated during his former visit, and there are at this time, in this country, a number of physicians practicing his specialty who can very well conduct any needful corrective measures along the

line which he worked out and made public. Some puzzled surprise is also expressed as to why he should bring to this country, rich in material resources and well endowed with skilful medical personnel, a service which must be much in demand in the country of his birth, and which now, in the time of financial depression which affects it, should as a matter of course be of largely increased value. Be that as it may; whether these free clinics should continue or not, whether he should be allowed license to practice without state examination or not, are matters to be determined by state legislative act.

We noticed, on the first page of one of the Washington (D. C.) papers, a short time ago, an article in which this noted surgeon's name appeared in bold type and which went on to say that his unusual vigor relative to his age was due to the fact that he had not so long ago profited by Dr. Steinach's procedure for rejuvenation. It was even stated that "a double operation had been performed." It seems to us that this is a case exactly in point. Who in the world would know whether he was proudly wearing two borrowed gonads or had undergone a double ligation unless he had volunteered the information himself? And of what possible interest could it be to anyone save the man who performed the operation, or to the one who underwent it, save as a matter of sensational "news" which must inevitably skirt very close to the edge of self-advertisement?

We of the medical profession have voluntarily taken up a vocation; no one compelled us to; we did so of our own choice and volition, and when we did so we understood perfectly well that there were certain conventions which it was incumbent on us to observe. It seems that the only dignified thing to do is to either observe these established dicta or join up with some occupation which sanctions, without restriction, the exploiting of either self or wares for sale.

JAMES ROBB CHURCH.



## ASSOCIATION NOTES

At a meeting of the Executive Council of The Association of Military Surgeons, February 3, 1942, the following names were proposed and elected to membership in the Association:

<p style="text-align: center;"><b>Medical Corps, U. S. Army</b> <i>Major</i></p> <p>Arthur W. Seidmore</p> <p style="text-align: center;"><b>Medical Reserve Corps, U. S. Army</b> <i>Lieutenant Colonel</i></p> <p>Frank Harnden</p> <p style="text-align: center;"><i>Major</i></p> <p>Abraham H. Dunn</p> <p style="text-align: center;"><i>First Lieutenant</i></p> <p>Ernest E. Halley</p> <p style="text-align: center;"><b>Medical Corps, U. S. Navy</b> <i>Commander</i></p> <p>Harold Wellington Smith</p> <p style="text-align: center;"><b>Medical Corps, New York N. G.</b> <i>Major</i></p> <p>James F. Rooney</p> <p style="text-align: center;"><b>Med. Corps, Philippine Constabulary</b> <i>First Lieutenant</i></p> <p>Jose P. Rosales</p>	<p style="text-align: center;"><b>United States Public Health Service</b> <i>Surgeons</i></p> <p>Horace K. Richardson</p> <p>Herbert C. Watts</p> <p style="text-align: center;"><i>Passed Assistant Surgeon</i></p> <p>Roy Preston Sandidge</p> <p style="text-align: center;"><i>Assistant Surgeon</i></p> <p>Fortunat A. Troje</p> <p style="text-align: center;"><i>Acting Assistant Surgeons</i></p> <p>Justo L. Castro Gutierrez</p> <p>John P. Stein</p> <p>Sheldon Stringer</p> <p style="text-align: center;"><i>Attending Specialist</i></p> <p>Samuel Wolfe</p> <p style="text-align: center;"><b>Associate Member</b> <i>Captain</i></p> <p>Charles S. Elliot</p> <p style="text-align: center;">Capt., M.A.R.C., U. S. Army.</p>
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## COMMENT AND CRITICISM

### AMERICAN MEDICAL ASSOCIATION ANNUAL SESSION, 1922

The May meeting of the American Medical Association to be held at St. Louis, May 22 to 26, promises well toward being the largest in attendance of any of the Association's sessions. Since the publication of the hotels in the *Journal of the Association* in December, inquiries and reservations are being made daily. The hotels and the Conventions Bureau are aiding the committee in a most satisfactory and helpful way to see that the Fellows are comfortably housed and accommodated. The A. M. A. meetings tax all cities entertaining them to the limit of hotel capacity. Whenever possible, a good Fellow should double up so that no one is left without comfortable lodging.

Reservations should be made by communicating direct with the hotels. If satisfactory arrangements cannot be made in this way, write to Doctor Louis H. Behrens, Chairman, Committee on Hotels, 3525 Pine Street, St. Louis, Mo.

### THE WELLCOME PRIZE ESSAY AWARDS FOR 1921

In the first prize essay—subject, "Measures for the Development of Organization and Extension of Usefulness of the Medical Reserve Corps Systems of the Government"—first place was awarded to Maj. Mahlon Ashford, M. C., U. S. A., and honorable mention to Col. J. R. Kean, M. C., U. S. A.

In the second prize essay—subject, "A Plan for the Conservation of Health of Males of the Second Decade in Relation to Military Service"—first place was awarded to Col. James Robb Church, U. S. A. (retired), and honorable mention to Capt. William M. Dow, M. C., U. S. A.

The board of award was made up of the following: Col. Charles R. Reynolds, M. C., U. S. A.; Col. Victor C. Vaughan, M. R. C.; Commander H. W. Smith, M. C., U. S. N.; Commander W. M. Kerr, M. C., U. S. N.; Surgeon G. W. McCoy, U. S. P. H. S.

### IN REGARD TO ANIMAL EXPERIMENTATION

The following two communications, which were sent to the editor, are of interest to medical men and show the recognition of the vital necessity of this class of work in forwarding the progress of the medical sciences:

## MASSACHUSETTS STATE FEDERATION OF WOMEN'S CLUBS

Whereas, it is impossible to estimate the number of persons alive today who owe their existence to the application of methods, preventive or remedial, made possible through scientific experimentation on animals; therefore, be it

*Resolved*, that the Massachusetts State Federation of Women's Clubs, assembled in Boston on December 15, 1921, in gratitude to medical science for past discoveries, beneficial both to humanity and to animals, go on record as favoring the continuance of medical research through animal experimentation.

LETTER TO THE COMMITTEE FOR THE PROTECTION OF  
ANIMAL EXPERIMENTATION FROM CARDINAL O'CONNELL, PUBLISHED IN THE BOSTON SUNDAY "GLOBE,"  
DECEMBER 11, 1921.

Scarcely a year passes in recent times which does not witness the rise of a new cult, with its equally new code of morality. One of the latest of these is antivivisectionism, according to whose tenets animal experimentation is morally wrong and should, therefore, be legally prohibited.

One may well ask, "Where is this fever of prohibition to end?"

We all know that Pasteur was a man of fine feeling, as humane as he was learned. As a Catholic, he knew well the true basis of all morality, and, good Breton, he was faithful to his religion as he was scientific in his medicinal principles.

Now Pasteur, whose high sense of morality no one has ever doubted, saved the lives of millions of human beings by the results which he obtained in animal experimentation. Without the freedom of experimentation which Pasteur exercised, progress in medicine would become practically impossible. Antivivisection would really mean the stagnation of that science.

No one can read what Mr. Ernest Harold Baynes has written in answer to the antivivisectionists without being driven to the conclusion that the opponents of vivisection base their chief argument on neither reason nor morality, but rather make a very unworthy appeal to morbid sentimentalism, relying for its propaganda upon what certainly appears to be deliberate misrepresentation. As between Pasteur and the promoters of this new cult, who can hesitate to stand with Pasteur?

W. CARD. O'CONNELL.

## BOOK REVIEWS

NOUVEAU TRAITE DE MEDECINE. Edited by G. H. Roger, F. Widal and P. J. Tessier. Fascicule III. Maladies Infectieuses. Paris: Masson et Cie, 1921, p. 556. Price, 40 francs.

The third volume of this most excellent system of medicine well supports the reputation for scientific accuracy and thoroughness that was shown in the first volume, reviewed in these columns some time ago. The present volume contains chapters upon typhoid fever and paratyphoid infection; the dysenteries; cholera; Malta fever; botulism; trench fever; grippe; plague and yellow fever.

More than half of the volume of 500 pages is devoted to a consideration of typhoid and paratyphoid fevers, written by Widal, Lemierre, and Abrami, and is, in truth, a remarkable treatise upon these important infections. It is doubtful if as valuable a chapter upon these fevers has ever before been published in any system of medicine, and it will stand for all time as an example of what such a treatise should be as regards fullness, accuracy and literary value. It is thoroughly up to date, and many American authorities are cited in the text. Full credit is given the wonderful results in the prophylaxis of typhoid and paratyphoid fever achieved by the Medical Department of the United States Army.

The chapters upon infection with the colon bacillus by Widal and Lemierre, upon the dysenteries by Dopter, and upon cholera by Ruffer are all adequate considerations of the subject, as are those upon botulism and Malta fever by Saequepee, trench fever by Strong, and grippe by Menetrier and Stevenin.

The chapter upon plague is written by Saequepee and Garcin and is one of the most valuable chapters in the book. The chapter upon yellow fever by Sodre is an excellent consideration of the subject and the recent researches of Noguchi as regards the etiology of the disease are exhaustively considered, the author accepting *Leptospira icteroides* as the probable cause of the disease.

In this volume, as in Volume I, there is the same careful and detailed attention paid to the bacteriology and pathology of the diseases considered that makes this system of medicine far superior to others recently published, rendering the work of the greatest value to the practitioner of medicine as well as to the medical scientist.

The book is finely printed and bound and the colored plates are excellent.

CHAS. F. CRAIG.

NOUVEAU TRAITE DE MEDECINE. Edited by G. H. Roger, F. Widal, and P. J. Tessier. Fascicule VII. Avitaminoses, maladies due to physical agents and nutritional disturbances, 552 pages. Illustrated. Paris: Masson et Cie., 1921. Price, 35 francs.

The seventh volume of this system of medicine is devoted to deficiency diseases, diseases due to physical agents, and nutritional diseases.

The introduction to the chapters dealing with deficiency diseases is by Roger and is a good résumé of the present knowledge regarding these diseases and the questions regarding the unity of the different affections classed under this heading. The subject of scurvy is discussed by Benoit, infantile scurvy by Alfaro, pellagra by Perroneito, and beriberi by Saequepee. All of these chapters are adequate and up to date and, owing to the personal experience of the writers, are authoritative. The same is true of the chapters upon anaphylaxis by Pagniez, the intoxications due to venoms by Calmette, and serum sickness by Courmont.

More than half of this volume, a chapter covering 330 pages, is devoted to the dis-

cussion of maladies due to nutritional disturbances, by Paul Legendre. In this chapter the subject of nutrition in general is discussed, followed by a discussion of the diatheses and a general discussion of the therapeutics of nutritional disturbances. There then follows very thorough considerations of obesity, diabetes mellitus, diabetes insipidus, and gout, all marked by the rich experience of the author and remarkable for accuracy in the scientific data presented and the great care with which recent literature has been reviewed and evaluated.

The book is well printed and bound and is a real contribution to medical literature.

CHAS. F. CRAIG.

**SOUTH AMERICA. From a Surgeon's Point of View.** By Franklin H. Martin, C.M.G., M.D., F.A.C.S., Director General, American College of Surgeons; Managing Editor, Surgery, Gynecology and Obstetrics. New York: Fleming H. Revell Co., 1922.

In this little book of some three hundred pages Dr. Martin not only gives much interesting information in regard to matters of medical interest in various states of South America, but also intimate sketches of the leaders in the profession in these states. His two trips were undertaken under the auspices of the American College of Surgeons in the interest of a closer and better acquaintance between the medical men of the two western continents. On one of his trips he was accompanied by Dr. William J. Mayo and on the other by Dr. Thomas J. Watkins, both influential members of the college. As well as Dr. Martin's notes and comments on matters medical, he includes in his monograph the views and observations of his two colleagues, thus giving us the views of not one observing and discriminating critic, but those of three.

In addition to the Foreword and the Introduction by Dr. Mayo there are nine chapters which are headed: The Voyage; Isthmus of Panama; Panama to Peru; Peru; Chile; The Andes; Argentina; Uruguay; Brazil; General Observations; Ecuador and Bolivia; and further, a summary of facts, historical, geographical, political, social and industrial, and an English-Spanish and English-Portuguese vocabulary.

The volume is attractively gotten up and contains many illustrations and portraits. In addition to dealing with medical education and practice in the countries of South America, it contains much valuable information on nontechnical lines and, merely as a guide book, would be a valuable acquisition to one contemplating a South American trip.

This exploiting of our neighbors in the south is a wise thing from any standpoint, and Dr. Martin is to be congratulated on having set forth the results of his visits in so logical and readable form.

JAMES ROBB CHURCH.

**THE LIFE AND TIMES OF AMBROISE PARE,** With a New Translation of his Apology and an Account of His Journeys in Divers Places, by Francis R. Packard. New York: Paul B. Hoeber, 1921. Price, \$7.50.

Not as court physician in the entourage of Catherine de Medici, as Dumas paints him, but rather as a military surgeon, does Dr. Packard make Ambroise Pare stand before us in this interesting and exceptionally well-illustrated volume. In the sixteenth century it was not unusual for a king to say that it was no matter if poor soldiers did die (p. 203), for seriously wounded to be killed instead of given their slim chance of life (p. 160), for prisoners to be murdered in cold blood (p. 220), for surgeons to be hated as was the cruel Roman Areabuto for their unconcern regarding pain. Into such a mode of warfare came Pare, serving under Henry II, Francis II, Charles IX, Henry III, and the King of Navarre (p. 3), and finding himself "in battle skirmishes, assaults and sieges of cities and fortresses" (p. 151). Yet, mindful of the aphorisms of Hippocrates, he ever exerted himself to heal the wounds of

war. He entered the besieged town of Dourlan in the garments of a servant in order to carry on his work (pp. 58, 244). At Hesdin he disguised himself as a common soldier (pp. 59, 249). In Germany he refused to let the wounded be left behind, but took them on himself and cured them (pp. 46, 184). When false rumors of poisoned drugs and poisoned bullets were afloat, he generously scouted them and set about his work (pp. 194, 248). Such medical service with the armies, centuries before the Hague and Geneva Conventions, was noteworthy.

Francis I had been "led by the frequency of the wars in which he was involved to a realization of the necessity for the improvement of surgery" (p. 17), and here was one who did yeoman service in such improvement. Believing with Aristotle that "experience is almost like science" (p. 155), and dropping a few jibes at the too bookish bookmen of the schools (pp. 164, 214, 215, 243, 251, 252, 254), he combined practical data with sound principles and evolved new practices, on the success of which his reputation rested for many decades. His chiefest innovations were the use of artificial labor in delicate cases of child-birth (worthy of mention here although not military in character), the trick of locating a bullet by having the wounded man assume the position he was in when hit (p. 40), the application of ligature in amputation (p. 25), and the abandonment of the almost brutal method of cauterizing gunshot wounds with hot irons or boiling oil (pp. 27, 162-3).

On his first campaign, in 1536, he ran upon his new method of dressing while serving in Italy across the Alps.

Now I was at that time a freshwater soldier. I had not yet seen wounds made by gunshot at the first dressing. I wished to know, first, how the other surgeons did for the first dressing which was to apply the said oil as hot as possible into the wound, of whom I took courage to do as they did. At last my oil lacked and I was constrained to apply in its place a digestive made of the yolks of eggs, oil of roses and turpentine. That night I could not sleep at my ease, fearing my lack of cauterization, that I should find the wounded on whom I had failed to put the said oil dead or empoisoned, which made me rise very early to visit them, where, beyond my hope, I found those upon whom I had put the digestive medicament feeling little pain, and their wounds without inflammation or swelling, having rested fairly well throughout the night; the others to whom I had applied the said boiling oil, I found feverish, with great pain and swelling about their wounds. Then I resolved with myself never more to burn thus cruelly poor men wounded with gunshot (p. 163).

Those were strange days in surgery, when honey and alum, or puppy oil (p. 69), or turpentine and brandy (p. 70) served for dressings, when doctors went about during the plagues with open cuts "as those who have such open sores do not contract the plague" (p. 79), when it was medical heresy to operate for cataract except during the waning of the moon (p. 114), when the "royal touch" was still considered a cure for scrofula (p. 110), when it was said that jaundice is made to disappear in a single night by means of a cachet hung about the neck (p. 94) and a hemorrhage checked by certain words spoken in Latin (p. 94), when blacksmiths' pincers were used to pull a spearhead from a wounded man (p. 43), and the heads of four executed criminals were mutilated in an attempt to find how lance splinters would fly in the brain and so to learn how to cure the wounded king, Henry II (p. 58), when the "wind" of a cannon ball caused a big bruise on a man's body (p. 179)—a new form of shell-shock, if you please.

Of course much of his medicine and surgery is out of date, perhaps even his anatomy, but still his life is interesting reading as Dr. Packard has so well told it, and his own "Apology" is full of pertinent and curious facts. "From the humblest origin he rose to high station solely as the result of his own genius" (p. 3). His collected works, published in 1552, "mark an epoch in surgery" (p. 112). When

out of dressings on the field, he bethought himself promptly where they could be found (p. 242). And one of his most frequent sayings is that in which he attributes the recovery of his patients to a divine providence: "I dressed and God healed him" (pp. 75, 160, 199, 256, 260). Yet perhaps the most subtle piece of philosophy which he ever emitted was with reference to certain magical cures which were firmly believed in in those superstitious days: "It is certain that sorcerers cannot cure natural diseases, nor physicians the diseases caused by sorceries" (pp. 94-5). As who should say Sorcery is good only for ills caused by sorcery, for if the ill is imaginary the cure can be imaginary too. The Duke of Savoy remarked: "He knew other things than surgery" (p. 33).

ELBRIDGE COLBY.

BATTLEFIELDS OF THE WORLD WAR; A Study in Military Geography, by Douglas Wilson Johnson. New York: Oxford University Press, 1921. Price, \$7.50.

A very remarkable volume. Not a guide book. Not a gazetteer. Not a photographic album. Exactly what its title says: "A Study in Military Geography," which, as General Tasker Bliss has remarked, is especially recommended to the military student.

Prof. Johnson of Columbia, who by the way served as a major in the M. I. D., illustrates here how another branch of human knowledge and experience may be useful in warlike days and ways. There is a story, apocryphal, perhaps, that when Lord Kitchener was visiting Egypt and Suez and inspecting the defenses which had been laid out there against the Turks, he nodded approval at the neat breastworks, and then, turning to the general officer commanding, who was on the tip of his toes awaiting approbation, remarked: "I say, are you defending the canal or is the canal defending you?" We should not, of course, put too much faith in what natural barriers can do in holding off the enemy. Troops can always cross rivers. Troops can always climb mountains. Troops, even in large numbers, can penetrate the most dense and deadly tropical jungles, as witness the campaigns in East Africa. Yet we must never lose sight of the fact that the "terrain" is a most vital element in our "Estimate of the Situation."

In this splendid volume, exceptionally well clarified with maps and pertinent photographs, Prof. Johnson has amplified and improved his former volume on "Topography and Strategy in the Great War" (1917). He has covered a wider field and covered it better. His sources of military information are more extensive and more accurate, and he has omitted the eastern theater, which he formerly touched, probably because he could not give such conclusive data concerning activities there. He takes up the different major fields of operations in turn, presents a clear picture of their salient characteristics as they would appear to the commander making his estimate, and then proceeds before passing to the next battlefield to tell the story of the conflicts that were waged on the hills and plains he has just visualized for us, pointing out always exactly how the geography of the region affected the strategy, the tactics, even the rate of advance and the problem of supply, when men and metal were being thrust forward to "bring the German colossus to its knees."

To read a history of the war without a map is to put an undue strain upon the imagination. Why not have a good map, then? Why not have a map which tells you the details of the terrain, the difficulties of mud and slope and rocky crest and chalky subsoil and wood and dominating height? All this you have if you read this volume, for it includes not only the maps with the names of places but also preliminary expositions of the character of the terrain in its especial relation to the aims of the opposing commanders. In his capacity as specialist in physiography, Prof.

Johnson lets no noteworthy detail escape him, permits us no opportunity of overlooking this little fact and that which influenced operations but which the military mind might be inclined to take too much for granted and not designate with full import. But, much more to his credit be it said, he has caught the purpose and intent of the military mind and has shaped his work in such a way that all his intelligence is bent to be of value for military purposes. He is geographer turned soldier, and every soldier should realize that he himself must be a bit of a geographer. If he does not yet think so, a careful perusal of this volume will convince him of the fact and will at the same time teach him much of the methods and means of applying military geography.

It is a book which should be in every military library. Every officer interested in operations should own one for frequent perusal and renewed scrutiny, and should not dare to lend his copy for a proper fear that it might be too well appreciated by the borrower and never come back to him again.

ELBRIDGE COLBY.

THE QUARTERMASTER CORPS IN THE YEAR 1917 IN THE WORLD WAR, by Henry G. Sharpe, formerly Quartermaster General. New York: The Century Company, 1921.

"It was not possible to terminate the statement with the end of the year 1917, for many of the contracts made in 1917 and many of the activities then inaugurated were not concluded until late in 1918. Particular pains have been taken, however, to avoid claiming credit for any organization or activity devised in a subsequent period." Thus speaks the author, fearful that he may be trespassing on the ground of his successors. Yet this work is a definite credit to the corps whose work made it possible. Written in all modesty, with very few criticisms where many might have been warranted, it shows how the troops were paid, housed, fed, and made ready for war in all but the tactical requirements—which last were outside the province of the Q. M. C.

The Q. M. C. functioned well. Of course there were mistakes, and of course it is not the duty of the head of that corps to point them out or to blame this officer and that for them, but generally the activities were a great achievement. To those of us who are too accustomed to think of a quartermaster as a man bound down by Army Regulations and red tape and requisitions and tables of allowances, there are startling revelations. "When no funds were available to pay for them" (p. 22) the Quartermaster Corps ordered 31½ million blank forms in March, 1917, so as to be ready for the immense expansion of the Army. They fought and fought for permission to enlist personnel for overseas (pp. 52-57), and in November, 1917, Pershing cabled for more of them. They quarreled and quarreled for permission to enlist motor experts, and finally sent some over in disguise and unauthorized (passing the word to France who and what they were) (pp. 63-4), and then were asked again for more. They tried and tried to get Graves Registration Units out, succeeded in slipping four overseas, and Pershing immediately cabled for 11 more (p. 67). They proposed and proposed and proposed cigarettes and tobacco and matches for the troops, and afterwards Pershing again cabled "More" (p. 104). Without waiting for results on tests of field shoes, in 1916 they adopted the British shoe and ordered a million, and had them on hand ready to ship, and then Pershing cabled "Nothing but" (pp. 148-149). They initiated the organization of "Transport Workers Battalions," and when they got overseas, again the cables said "More" (p. 369). They opened bids for clothing in February and March, 1917, and got a good start (p. 135). From March 4 to June 15 they were "practically without funds" to pay the troops (p. 10), so they overlooked the law about vouchers for certain services not being

hypothecated, urged the Federal Reserve Banks to help out, had all quartermasters turn in their cash balances—irrespective of appropriations—and borrowed consistently from one appropriation to meet immediate money demands for which Congress had not provided. When the law forbade, they either hunted up disused statutes or else—with the connivance of the Comptroller of the Treasury—actually broke the law (pp. 81-83).

Instead of jealously harboring supplies and demanding formalities, the Quartermaster Corps was trying to be one jump ahead all the time. Frequently they were handicapped by not being able to get any data as to future plans (pp. 85-88), by not getting sufficient officer personnel (pp. 23-24), by being held up a month and a half in getting approval of requests that later took only three days to secure (pp. 35-49). The corps had, before war was declared, "a complete list" of all vessels which might suitably be commandeered, including their capacity in troops and animals and their sea speed (p. 359).

In one day the Office of the Quartermaster General handled 111,000 pieces of mail (p. 20). And this mail was handled. An expansion beyond the wildest dreams of the most visionary supply or tactical officer found serious shortages all over the country, even a shortage of \$1,000,000 worth of old clothing which the National Guard should have had on hand even for peace-strength requirements (p. 131) and others in comparison. Yet every drafted man was fed from his first meal in his entonement, he was clothed in spite of the shortage of clothing, he was housed and taken care of.

Every officer of whatever branch of the service, staff or line, should read this book. It is far more impressive than "America's Munitions." It shows a foresight, a resolution, a comprehension of the desire to cooperate and the spirit of cooperation which is needed all through the service. Its most pertinent lessons are two: a realization that everything must be done, even to smashing regulations, in time of emergency for the efficient service of the line; and the need of preparation.

"A country," says General Sharpe, "which adopts a policy of neglecting, in time of peace, to prepare for war insists upon the utmost economy as regards money matters and adopts a most improvident and wasteful extravagance of time. . . . When such a country is later forced into war, it necessarily is compelled to reverse its action and, in order to provide for the troops in the short time available, must exercise economy as to time and be extravagant as regards money."

ELBRIDGE COLBY.

FROM PRIVATE TO FIELD-MARSHAL, by Field Marshal Sir William Robertson. Boston and New York: Houghton, Mifflin Company, 1921. Pp. xx + 396. Price, \$5.

Here is the story of "the climbing of a soldier from the bottom to the top of the military ladder." Here—in the second half of this volume—is the story of the British General Staff during the World War, its problems, its decisions, its duties. It is in the main a personal record of personal achievement, and therefore the personal pronoun enters not infrequently.

Viscount Wolseley, whom Robertson calls "the best-read soldier of his time," tells in his "Story of a Soldier's Life" how the ambitious officers of the British Army "spent those deadly midday hours of an Indian summer, while the rest of the population was taking a siesta, in reading military history and the lives of great commanders." Here Robertson tells how he himself, "by retiring early, avoided the rather common and injurious habit of sleeping during the day, and utilized the time in learning Hindustani."

Again: "By rising regularly every morning between four and five o'clock, in



winter as in summer, I was able to get through a great amount of work before going to the office for the day." And, in Lord Roberts' book, "Forty-One Years in India," we find how he "studied from morning till night" and "performed regimental duties in addition to staff work." All three of these gentlemen rose to the rank of field marshal. In reading the life of Sir William Robertson, as in reading the lives of Wolseley and Roberts, we can learn one main lesson: *Study*. Study the "lives of great commanders" for examples; study the facts underlying the business in hand for advancement.

In these three autobiographies there is still another point of similarity all the more marked in the case of Robertson, as his rise was greater. Each of these three secured responsibility and distinction through staff work—Roberts in the administration of supply, Wolseley in engineering work, and Robertson in intelligence, for which his study of languages fitted him. They equipped themselves with a broad knowledge of the many requirements on an army in training and operations. "I would warn all officers who wish to make their mark and serve their country well," says Robertson, who was the oldest lieutenant and the youngest colonel in the Army, "that they may one day incur a considerable handicap if they fail to take advantage of the assistance which is offered by the Staff College course."

There is little in Robertson's autobiography of much value as history, because it is so personal. But the very fact of its being personal gives it concrete interest. Here is a soldier who served his turn at sentry-go; who served in the guard-house; who had the Articles of War read to him; who stood muster once a month to satisfy the King's Regulations; who tried "bucking for orderly"; who allowed a man to escape, who allowed a horse to escape, and who then allowed both a man and a horse to escape. And he ended by becoming Field Marshal, principally because he read all the books on tactics, strategy and past campaigns he could lay his hands on, and kept himself fit—even on the trying plains of India—by temperate habits and suitable exercise. Beside this record of achievement, what matter the exasperating and constantly recurring proposals of new plans and changes of plan for the conduct of the Great War?

Robertson's account of the conflict is a recital of opposing theories of strategy proposed by ministers and generals, of opposing elements of a diplomatic, political, military and tactical character. Yet through it all he moves as Chief of the Imperial General Staff, recording what goes on, recording who comes and goes, recording what measures are judged sound and why and what unsound and why.

Brief and gossipy and not very important are the notes on his work as chief of the Eastern Command and as Commander-in-Chief, Great Britain, and later as Commander of the Army of the Rhine. But what of it? This volume is not history and need not be read as such. It is autobiography. Seldom is it given for a private soldier to rise from the ranks to be a field marshal, and this without himself fighting in a single battle. Although too replete with emphasis on the personal pronoun, although showing a trifle too much petulance over the transfer from the War Office and the Imperial General Staff to Home Defense, and over finding himself joining the unemployed officers on half-pay after commanding on the Rhine, although a trifle too evidently a monument of self-congratulation with its appended lists of "Dates of Promotion" and "Foreign Honors Received" and its frequent quotation of laudatory notes, this book by Field Marshal Sir William Robertson is a record of achievement and a personal history of value to all military men. It is, in the main, a good example. It shows a gradually increasing capacity and usefulness. It shows the details of staff organization and administration and the necessity for understanding war on broad and general lines.

EDMUND COLLY

## Obituary

Those of our membership whose deaths have been noted since our last report are as follows:

**Col. Joseph T. Clarke, M. C., U. S. Army.**

**Capt. Emil Heuel, M. C., N. Y. N. G.**

**Dr. Joseph MacDonald.**

**Capt. George P. Stallman, M. R. C., U. S. Army.**

**Dr. F. W. Wunderlich, M. C., U. S. Navy.**

# THE MILITARY SURGEON

VOL. L

APRIL, 1922

NUMBER 4

## MEASURES FOR THE DEVELOPMENT OF ORGANIZATION AND EXTENSION OF INFLUENCE OF THE MEDICAL RESERVE CORPS SYSTEMS OF THE GOVERNMENT.

THE WELLCOME FIRST PRIZE ESSAY, 1921

By MAJOR MAHLON ASHFORD

*Medical Corps, United States Army*

"PEACE," say our military primers, "is but a slowing up of war." While this somewhat Prussian epigram may well offend our sensibilities, it epitomizes the eternal struggle between nations, which no sooner emerge from one conflict than they begin to prepare for another. It is true that the nations are seeking at this very moment a limitation of these preparations in peace time for war so that they may thereby lessen the tremendous economic burden now imposed upon humanity. This very fact, however, crystallizes the conception of a world whose diverse national elements are constantly engaged in a gigantic struggle for supremacy—a struggle in which the engaging warriors are only recuperating in times of peace for that more active phase of the contest which we know as war. Peace, then, may be compared to a powerful motor in first gear. Ours is the problem of constructing a mechanism which will transform the complex civilization of a modern nation from the comparatively slow and steady processes of peace into the high gear of war with least loss of time, power and endurance.

If we regard those measures which render war terrible and terrifying to humanity as steps leading the race to abandon or at least control warfare, we may well see in the World War many innovations which give us comfort as a peace-loving people. Perhaps the most significant advance in the science of war developed in this latest and greatest human conflict is the conception that a nation at war must organize and utilize every individual human as well as every material and moral resource. In short, a nation at war will hereafter endeavor to employ in its vital struggle, not merely its young manhood, but its entire adult population. I do not mean to prophesy that women will be used in combat areas in future wars, although this has occurred in both ancient

and modern times, but I do mean that military nations will endeavor to utilize every adult person in some capacity or manner to overcome the enemy. I dwell upon this point for the reason that any study of war preparedness which fails to visualize the entire nation going to war with all of its human, moral and intellectual forces organized and marshalled against the foe, falls short of the tremendous, terrible and terrifying spectacle of the next great war.

To maintain the organization of a mighty nation for war in the years of peace, what a vast and intricate problem! The German Government sought to do this for years prior to 1914 and came nearer, no doubt, to accomplishment than we can expect to see again in our day and generation. For the German General Staff received the support and encouragement of a war-loving and autocratic government which, in a fashion nationally characteristic, studied with infinite care and detail the science of organization for war and executed its plans with ruthless *sang-froid*. To this end the German peoples were led to desire or at least to accept the Great War as an inevitable event from which they felt assured they would soon emerge victorious and overladen with the rich spoils of war. On the one hand, their philosophers and religionists justified and glorified war; on the other, their political writers persuaded the people that their national expansion, nay, even their national existence, hinged upon the issue of an unavoidable European conflagration. In short, then, the German General Staff recognized that the first step towards universal participation in its preparation for a sudden offensive war must be universal belief among its people in the certainty of war.

While it is improbable that any nation, and least of all the American people, will in our time systematically institute propaganda of this character for an offensive war, it is manifest that all nations for self-protection will continue to educate their peoples in the necessity for national preparedness to resist foreign aggression. For it is self-evident that no general interest or participation in a National Military Reserve can be maintained unless we first establish belief in its necessity—in short, unless we establish in the minds of our people belief in the possibility that the United States may at any time be forced to defend its honor and interest. Viewing this phase of the subject broadly, then, we conclude that propaganda conducted in time of peace to lead a people to an offensive war is itself an act of war even though conducted many years before actual declaration of hostilities, and such propaganda is a crime against humanity; propaganda in time of peace for the sole purpose of educating a people to be prepared to resist aggression is in accord with the natural and primal instinct of humanity for self-pres-

ervation and is eminently defensible from a moral standpoint; propaganda conducted with a view to creating in a people the belief that no system or organization for national defense is necessary or right is fundamentally traitorous to the ultimate destiny of the nation; and finally, without a general belief among the people of a nation that self-defense through an appeal to arms is at all times a possible event, no organization of a Citizen Reserve can be maintained in an appreciable degree national in character.

The inculcation in the minds of our people of the idea that a defensive war is not an impossible nor necessarily distant event may be regarded therefore as a primary measure in developing the organization of a National Military Reserve. It is true that at this period there is a natural reaction against the horror and inutility of war, and it is further true that the great nations are even now endeavoring to conclude a pact which will lighten the economic burden of armaments and lessen the probabilities of international misunderstanding and conflict. The very fact, however, that we propose to do away with our costly armaments, our battleships, our chemical gases and other bulwarks against sudden and unforeseen aggression is the strongest possible argument for building up an organization of our entire people which, in the absence of these monsters of sea and air, can be quickly mobilized for the purpose of national defense. Finally, it must be conceded that we possess in our own confines potentialities which may at any time threaten our national life and the individual lives of our wives and children. The organization of our business, our commerce and our labor is built on so vast a scale that industries essential to the life of our people may be within the control of a small minority. Against such dangers a national military organization of our people, democratic in character, is the greatest safeguard against civil strife far more terrible in its effects than conflict with a foreign foe.

Let us for a moment take stock of our strictly military resources.

On land we have obliterated our standing army except for a small body scarcely sufficient for colonial police, essential manning of important fortifications and excessively meager training operations. We have, it is true, a corps of trained officers slightly in excess of the actual needs of our present enlisted strength. This excess we can well apply, as we shall see hereafter, to the organization and training of our reserves. At the present time also we have a Veteran Reserve and National Guard as a visible asset of our participation in the World War. The military value of this reserve will decrease with the passage of time unless we utilize it in the organization and training of our Citizen Reserve. On the sea, we may expect to have a navy at least the equal

of any probable antagonist. Moreover, as in the case of the land forces, we have in our citizenship many thousands of veterans of our war navy whose military value will gradually decrease with the passage of the years. Thus stand our Army and Navy.

Of far greater value potentially for larger purposes of defense than the present standing forces is the military policy recently adopted by our people through their representatives in Congress which provides for the organization and development in peace time of a military reserve capable of expansion in time of danger into a National Army comparable in numbers and efficiency to the National Army which was developed towards the close of the late war.

It is unquestionably the patriotic duty of public spirited American citizens to consider thoughtfully the provisions of this newly created National Reserve in its application to them as individuals and as members of some industrial, commercial or professional group in order that measures may be determined for the development and extension of this reserve system which is the real bulwark of our national protection from foes within and without. The study of a National Military Reserve embraces every form of human endeavor and is far beyond the scope of this paper, which must be confined to the single professional group of the Medical Reserve Corps. Furthermore, since the organization of a Medical Reserve for the Army, Navy or Public Health presents the same basic problems, we will devote our study chiefly to the development of a Medical Reserve Corps for our land forces as fundamentally applicable in principle to all the military services. Having reduced our discussion to the Medical Reserve Corps systems of the Government, the thought at once occurs to us that in so doing we are dealing with the one reserve system whose members are engaged both in peace and war in saving human life, lessening human suffering and battling always with death, disease and pestilence. The development of the Medical Reserve Corps systems should not, then, logically receive the opposition of the zealots of pacifism since this corps occupies the unique position of serving humanity equally in peace and war for the lessening of human woe. If wars and civil strife should come, Medical Reserve Corps systems are a blessing to stricken mankind. If not, these same organizations, by strengthening the bonds of professional fellowship and by creating the framework of an efficient national organization, will serve to combat the constant presence of endemic and the occasional presence of epidemic preventable disease.

As a starting point in this study let us review the salient provisions of the National Defense Act of 1916 with its several amendments, devoting especial attention to the creative Act of June 4, 1920, which

expresses for the first time in our national history a military policy. We will then examine the interpretation and operation of these provisions of law as contained in the Regulations published by the authority of the Secretary of War for the organization of the Officers' Reserve Corps and the Reserve Officers' Training Corps. Finally we will consider the measures to be taken under this interpreted enabling act for the development of organization and extension of usefulness of the Medical Reserve Corps systems of the Government.

In the beginning we learn from Sec. 1:

That the Army of the United States shall consist of the Regular Army, the National Guard while in the service of the United States, and the Organized Reserves, including the Officers' Reserve Corps and the Enlisted Reserve Corps.

That this definite inclusion of the Organized Reserves in the composition of the United States Army shall be actual is shown by Sec. 3, which states:

The organized peace establishment, including the Regular Army, the National Guard and the Organized Reserves, shall include all of those divisions and other military organizations necessary to form the basis for a complete and immediate mobilization for the national defense in the event of a national emergency declared by Congress. The Army shall at all times be organized so far as practicable into brigades, divisions and army corps, and whenever the President may deem it expedient, into armies. For purposes of administration, training and tactical control, the continental area of the United States shall be divided on a basis of military population into corps areas. Each corps area shall contain at least one division of the National Guard or Organized Reserves, and such other troops as the President may direct. The President is authorized to group any or all corps areas into army areas or departments.

That officers of the Organized Reserve shall have a guiding hand in the development of this reserve is shown in Sec. 3a and Sec. 5, which in part provide:

Subject to revision and approval by the Secretary of War, the plans and regulations under which the initial organization and territorial distribution of the National Guard and the Organized Reserves shall be made, shall be prepared by a committee of the branch or division of the War Department General Staff, hereinafter provided for, which is charged with the preparation of plans for the national defense and for the mobilization of the land forces of the United States. For the purpose of this task said committee shall be composed of members of said branch or division of the General Staff and an equal number of reserve officers, including reserve officers who hold or have held commissions in the National Guard. Subject to general regulations approved by

the Secretary of War, the location and designation of units of the National Guard and of the Organized Reserves entirely comprised within the limits of any state or territory shall be determined by a board, a majority of whom shall be reserve officers, including reserve officers who hold or have held commissions in the National Guard and recommended for this duty by the governor of the state or territory concerned.

All policies and regulations affecting the organization, distribution and training of the National Guard and the Organized Reserves, and all policies and regulations affecting the appointment, assignment, promotion, and discharge of reserve officers, shall be prepared by committees of appropriate branches or divisions of the War Department General Staff, to which shall be added an equal number of reserve officers, including reserve officers who hold or have held commissions in the National Guard, and whose names are borne on lists of officers suitable for such duty, submitted by the governors of the several states and territories. For the purposes specified herein, they shall be regarded as additional members of the General Staff while so serving.

We must note with particular care the wording of that portion of Sec. 3a which provides for a committee to be concerned with the preparation of plans for the national defense and for the mobilization of the land forces of the United States; and to be composed of members of the General Staff and an equal number of reserve officers; and further provides for a board, the majority of whom shall be reserve officers recommended for this duty by the governor of the state or territory concerned. It is of large importance to the medical profession of America to secure membership on this committee and board in order that this important professional group shall be assured of representation in the important functions of these two bodies.

We will now pass over many sections referring to the Regular Army exclusively until we reach Sec. 37, which provides explicitly for the Officers' Reserve Corps. The essential facts in this section for our present study appear to be:

1. Officers of the reserve may be appointed in all grades and sections authorized for the Regular Army.

2. Appointments are for a period of five years, but an appointment in force at the outbreak of war shall continue until six months after its termination.

3. The President of the United States may at any time void an appointment.

4. A reserve officer appointed in time of war is entitled to discharge six months after its termination.

5. Appointees must be citizens of the United States or the Philippine Islands between 21 and 60.

6. Any officer of the National Army between April 6, 1917, and June 30, 1919, or an ex-officer of the Regular Army, or an officer of the National Guard is eligible for appointment.



7. Specific limitations as to eligibility for appointment and grade are laid down for all other appointees, especial favor being granted to graduates of Reserve Officers' Training Corps.

8. Reserve officers must serve at least one year in a grade to be eligible for promotion.

9. A reserve officer may hold a commission in the National Guard without vacating his reserve commission.

Sub-section 37a provides for placing reserve officers on active duty and contains the following points of especial interest:

The President of the United States may order Reserve Officers to active duty at any time and for any period, provided funds for this purpose are available, but except in National emergency no Reserve Officer shall be employed on active duty for more than 15 days in a calendar year without his own consent. While on active duty Reserve Officers receive the pay and allowances of their grade and mileage to and from place of duty.

The next subject which is given consideration is the Reserve Officers' Training Corps, which is dealt with in Secs. 40, 44 and 47.

Two classes of units are authorized: the senior for universities, colleges and similar institutions; the junior division for high schools and other schools falling into the general class of preparatory schools. For the formation of units of either class it is required that an officer of the Regular Army shall have been detailed as Professor of Military Science and Tactics and that the unit shall enroll and maintain a membership of not less than 100 students in the case of schools training men for the three major combat arms and not less than 50 students for other branches. The institution must furthermore require a two-years' compulsory course as a prerequisite for graduation for those entering thereon unless relieved from this obligation by the authority of the Secretary of War. The institution must also provide a course of a definite number of hours each week, customarily not less than three for this military instruction. The accepted students must be citizens of the United States, not less than 14 years of age and able-bodied. For the instruction of these students the President is authorized to use officers and enlisted men, both active and retired, and he is also empowered to employ the necessary military material, public animals, transport, ordnance and equipment. The Secretary of War is authorized to maintain camps for the further practical instruction of the members of the Reserve Officers' Training Corps for a period not to exceed six weeks, except in time of actual or threatened hostilities, and to transport students to and from said camps and furnish medical attendance, hospitalization and supplies for their care; and use the troops and supplies of the Regular Army for their training.

The President of the United States is authorized to appoint as a reserve officer of the United States Army any graduate of the senior division of the Reserve Officers' Training Corps or any graduate of the junior division who has satisfactorily completed the prescribed course of instruction, who has reached the age of 21 years, and who will subscribe to the required oath of office. This authorization of the Reserve Officers' Training Corps units and the linking of these units to the Officers' Reserve Corps through eligibility of graduates of the former for membership in the latter will probably prove to be one of the most valuable features of the amended National Defense Act.

Sec. 47c, relating to pay and commutation of subsistence, Reserve Officers' Training Corps, has such specific provisions of concern to the Medical Reserve Corps that I shall quote it in its entirety.

When any member of a senior division of the Reserve Officers' Training Corps has completed two academic years of service in that division, and has been selected for advanced training by the president of the institution and by the professor of military science and tactics, and has agreed in writing to continue in the Reserve Officers' Training Corps for the remainder of his course at the institution, devoting five hours per week to the military training prescribed by the Secretary of War, and has agreed in writing to pursue the course in camp training prescribed by the Secretary of War, he may be furnished at the expense of the United States commutation of subsistence at such rate, not exceeding the cost of the garrison ration prescribed for the Army, as may be fixed by the Secretary of War, during the remainder of his service in the Reserve Officers' Training Corps, not exceeding two years: *Provided*, That any medical, dental, or veterinary student may be admitted to a Medical, Dental, or Veterinary Corps unit of the Reserve Officers' Training Corps for a course of training at the rate of ninety hours of instruction per annum for the four collegiate years, and if at the end of two years of such training he has been selected by the professor of military science and tactics and the head of the institution for advanced training, and has agreed in writing to continue in the Reserve Officers' Training Corps for the remainder of his course at the institution, and has agreed in writing to pursue the course in camp training prescribed by the Secretary of War, he may be furnished, at the expense of the United States, with commutation of subsistence at such rate not exceeding the cost of the garrison ration prescribed for the Army, as may be fixed by the Secretary of War, during the remainder of his service in the Reserve Officers' Training Corps, not exceeding two years: *Provided further*, That any reserve officer who is also a medical, dental, or veterinary student may be admitted to such Medical, Dental, or Veterinary Corps unit for such training, under such rules and regulations as the Secretary of War may prescribe: *Provided further*, That members of the Reserve Officers' Training Corps, or other persons authorized by the Secretary of War to attend advanced course camps, shall be paid for attendance at such camps at the rate prescribed for soldiers for the seventh grade of the Regular Army.

Sec. 47d authorizes the Secretary of War to maintain training camps for military instruction and provides the necessary personnel and matériel for this purpose. The succeeding sections of this Act deal with the enlisted reserve; military equipment for other schools and colleges; the National Guard; and miscellaneous provisions of no material import to the present study.

We have reviewed in some detail the National Defense Act for the obvious reason that development in any branch of the Officers' Reserve Corps can best be sought along the paths indicated by this epochal legislation.

What, then, are the basic advantages gained for the organization and development of the Officers' Reserve Corps by this Act?

First and foremost by far is the provision for the establishment and maintenance of the Reserve Officers' Training Corps in our schools, colleges and universities. This is true in the first place because we have here tapped the fountain of eternal youth from which we can forever draw young men with their enthusiasm, energy and potential development. We are provided with our students when they are most available for instruction without disturbing our economic life and when they are most capable of receiving instruction. The main reasons for arriving at the decision that the educational age is the best one for giving basic military instruction are so obvious that their review is unnecessary. We will also remember that the system provided by this Act, which I shall hereafter refer to as the American system, offers a basic military training with least possible inconvenience to the individual or his family or the economic life of the state. Contrast for one moment the American system with that of certain of the European Powers which demand a year or more of the full time of every able-bodied youth for military servitude.

Finally, I invite attention to the fact that the American system is so geared that young men from our schools and colleges, as well as enlisted men and civilians of all classes who attain the necessary training and fitness, may pass almost automatically into the great body of our reserve officers and thence in time of war or threat of war into active military service.

The last step brings me to consider the second great feature of the American system. This is the actual organization in time of peace of a military organization for war based upon the known military experience and special qualifications of each individual. The desirability of this is too apparent to the present generation of men, and especially to the present generation of medical men, to require commendation. It has often been said that a captain of infantry is an officer who may be as-

signed without further classification. He is a known element suited for specific assignment to any infantry organization. How vastly different is the problem in the assignment of a captain of the Medical Corps. Is he a surgeon or a physician, an eye specialist or an orthopedist? Modern medical practice requires many specialties and in each their separate classes. Moreover, when the specialty is determined the degree of experience and skill must govern the intelligent assignment of medical personnel.

I have purposely passed over the features of the Defense Act dealing with the National Guard, in order not to confuse the mind of the reader who has not given attention to the details of this Act. The National Guard has in no sense lost its value as a national asset in our defense program by the measures devised to strengthen the Organized Reserves. On the contrary, it is immeasurably advanced and at the same time coordinated with the Regular Army and Organized Reserves by the Act of June 4, 1920. The essential feature of the Act in this particular provides for the National Guard merging into the Army of the United States almost automatically when called into the service of the Federal Government. Section III is as follows:

When Congress shall have authorized the use of the armed land forces of the United States for any purpose requiring the use of troops in excess of those of the Regular Army, the President may, under such regulations, including such physical examination as he may prescribe draft into the military service of the United States, to serve therein for the period of the war or emergency, unless sooner discharged from the militia, and shall be subject to such laws and regulations for the government of the Army of the United States as may be applicable to members of the Army, whose permanent retention in the military service is not contemplated by law, and shall be organized into units corresponding as far as practicable to those of the Regular Army or shall be otherwise assigned as the President may direct. The commissioned officers of said organizations shall be appointed from among the members thereof; officers with rank not above that of colonel to be appointed by the President alone, and all other officers to be appointed by the President by and with the advice and consent of the Senate. Officers and enlisted men while in the service of the United States under the terms of this section shall have the same pay and allowances as officers and enlisted men of the Regular Army of the same grades and the same prior service. On the termination of the emergency all persons so drafted shall be discharged from the Army, shall resume their membership in the militia, and, if the state so provide, shall continue to serve in the National Guard until the dates upon which their enlistments entered into prior to their draft would have expired if uninterrupted.

As we have already seen, a reserve officer may also hold a commission in the National Guard and, furthermore, all National Guard officers are

at once commissioned in the Officers' Reserve Corps when their units are called into the Federal service. These provisions effectually remove causes for jealousies or disturbing differences and render the Medical officers of the Regular Army, the National Guard and the Organized Reserve brothers with equal rights, privileges and responsibilities in the Army of the United States.

Having considered the provisions of the National Defense Act in their application to the Officers' Reserve Corps, it is necessary to review the steps taken by the War Department in interpreting and applying this law to the development of the Organized Reserves. These are contained in Special Regulations No. 43, published by the War Department August 4, 1921.

Section II of this publication outlines the general policies governing the Officers' Reserve Corps. Consideration of certain paragraphs of this section are essential to any study of measures to develop the Reserve Corps.

#### *Appointment:*

The Officers' Reserve Corps is established for the purpose of providing a reserve of officers available for military service when needed. It is not a separate component of the Army, but is the corps which furnishes the necessary reserve officers for assignment to all components of the Army of the United States. Its members will therefore normally be assigned or attached to authorized organizations of the Army of the United States in time of peace. The numbers of reserve officers assigned or attached to organizations of the Organized Reserves in time of peace will not be limited to the strict requirements of tables of organization, but will include the officers required for replacements and for the formation of such new and additional units as may be required after the initial mobilization. Appointment as a reserve officer is not, in any case, to be the mere conferring of a rank, but is made to fill an office in which service may be rendered. Appointments are not honorary or rewards for past service but are based primarily upon the qualifications of the appointee to perform satisfactorily the duties of a particular office.

In view of the large number of reserve officers needed and the experience had in the World War in developing officer material, it is essential, in building up and maintaining the necessary number, that cognizance be taken of the widely different qualifications required for filling various offices. Good combat officers are difficult to obtain and should not be used for noncombatant duty if it can be avoided. Conversely, the required technical experts and specialists should be provided and utilized in their proper spheres. With this in mind reserve officers are divided into two general classes.

The two general classes of reserve officers are the following:

a. *Officers for service with troops.* . . .

b. *Officers for special service.*—This class includes officers not concerned with the tactical handling of troops, and, in general, includes

those officers whose duties in the Army are along the lines of a profession or occupation in civil life. As their work in civil life, to a great extent, fits such officers for their contemplated service in the Army, they may be appointed largely on their professional or occupational standing and experience. After appointment they should be prepared, in general, to devote such time to military instruction as will enable them to know how their special qualifications fit into and can be best utilized in the military service, and to the performance of the peace time duties of the organization to which they may be assigned.

For special service the duties involve a limited knowledge of organization and the care and use of troops. The special service, however, will be along the lines of civil professions or occupations. The primary requisites, in addition to the fundamental qualities of moral fitness and general education, are satisfactory knowledge of and standing in some profession or occupation with ability to adapt such knowledge to the requirements of military service.

The law confers certain eligibility for appointment on persons who served as officers during the World War. Such appointments can generally be made from an examination of records, but as time elapses records of World War service become less reliable and valuable as evidence of fitness for appointment. Individuals change, as so also the requirements of the military service. Some instruction and training are necessary to keep persons who have served in the Army qualified for service in a future emergency. World War records cannot be accepted for an indefinite time as evidence of qualifications for appointment. Furthermore, after the Officers' Reserve Corps has reached its required strength, vacancies in grades above the lowest should be filled by promotion rather than by making new appointments. Prompt mobilization in an emergency requires that officers be already enrolled and does not permit of the delay incident to reviewing past records and ascertaining the physical and other fitness of applicants for appointment. World War veterans are needed and their services are urgently desired without delay to assist in the organization and development of the Army of the United States under the provisions of the amended National Defense Act. From a consideration of all factors it has been deemed expedient to place a time limit, until November 11, 1923 (five years after the termination of hostilities), upon the appointment of former officers by an examination of their records alone. After that date World War service will receive due consideration, but will not, of itself, be accepted as evidence of qualification for appointment, and additional demonstration of qualification by examination will be required. The time limit placed is reasonable and allows ample time for former officers, who so desire, to become members of the Officers' Reserve Corps.

The National Defense Act permits officers of the National Guard to hold commissions in the Officers' Reserve Corps. Such dual commissions are desirable, with the understanding that the individual is not thereby placed in the status of a reservist in two capacities. National Guard officers, when appointed in the Officers' Reserve Corps, remain assigned to and receive their training with the National Guard

and, in the event of an emergency, will be drafted into Federal service with that component of the Army.

Reserve officers are needed primarily, but not exclusively, for units of the Organized Reserves. They should be assigned, so far as practicable, to units organized near their places of residence. The location and development of units of the Organized Reserves is delegated to department and corps area commanders. Available reserve officers are also allotted to them for assignment. As the organization of units progresses, and it is found that additional officers are needed, it is contemplated that suitable and available officer material will be located and obtained by the department or corps area commanders under some of the means provided for appointment. The procurement of reserve officers for the Organized Reserves is thus largely in the hands of the department or corps area commanders. As soon as practicable a full quota of officers for the Organized Reserves should be procured and maintained, as well as the officers that will be required in emergency for the other components of the Army of the United States.

It is contemplated that, so far as practicable, any future mobilization will be largely one of organizations and not of individuals. The reserve officers who have, in time of peace, obligated themselves to service, and who have received training and instruction, will be called to active duty, either with the organizations to which they have been assigned, or for the special duty to which they have been assigned in time of peace. It is not contemplated that persons who have failed to join the Officers' Reserve Corps and to receive instruction in time of peace will be appointed in an emergency until such time as it becomes apparent that the existing reserve of officers is inadequate. Those persons who are appointed and serve in time of peace are thus assured priority for service as officers in war over those who decline or fail to secure appointments in time of peace.

The foregoing paragraphs contain much essential information concerning the general policies of the War Department in connection with the appointment of officers and the development of a reserve military organization. Furthermore, the reasons upon which these policies are based is clearly stated. From these it is manifest that the department plans to develop a military reserve capable of mobilization by organizations rather than by individuals; but this reserve is to be so formed that the individual components shall be carefully selected so that qualified appointees will be assigned to duties consonant with their known capabilities. It is further apparent that the department seeks to maintain an efficient Citizen Reserve with the least possible demand upon the time and the greatest possible consideration of former service, and present associations of its members.

#### *Promotion:*

All steps taken in time of peace in the development of the Officers' Reserve Corps, including promotions therein, must be with a view to

readiness for the prompt mobilization of an efficient army in time of war. In time of war, after the components of the Army have been called to active service, all officers will be equally eligible for promotion, regardless of whether they have served, in time of peace, in the Regular Army, the National Guard, or the Organized Reserves. Promotion in time of war must, in general, be based upon a method of selection, with due consideration of the needs of the military service and the relative qualifications of persons available for promotion. The promotion system embodied in these regulations is applicable in time of peace only. The system is formulated with a view to giving such promotion as appears reasonable and proper in time of peace, with the understanding that, in time of war, conditions will afford exceptional officers an opportunity, which is lacking in time of peace, to demonstrate clearly their military capacity and fitness for advancement.

It is impossible to determine in time of peace the full extent of the qualifications of reserve officers for duty in time of war. Their promotion, in time of peace, must be based upon considerations of their general and professional qualifications, the interest manifested by them, their length of service, and age, with a view to providing reasonable advancement to the grades for which it is believed they will be fitted in time of war and from which they will have a fair and equal opportunity for further advancement under conditions of active service.

With a view to developing the interest, ability, and qualities of military leadership of the citizen soldier, the system of promotion is designed to afford any competent reserve officer an opportunity to rise by successive steps to any office in the Army which is to be filled, and for which he has the ability to qualify. With this object in view, no fixed numbers are prescribed for the various grades and branches of the Officers' Reserve Corps. So far as the numbers in each grade are concerned, the only restriction placed upon promotions is that there must be a suitable office and duty to which any promoted officer can be assigned.

In addition to theoretical training and instruction, an officer, to be qualified for promotion, must have the knowledge and judgment that develop with age and experience. A minimum length of service in a grade is, therefore, required as a condition of eligibility for advancement to the next higher grade. The minimum of one year required by law being of limited application, a minimum of three years' service in a grade is required by these regulations. Of the three years, one must be in the Officers' Reserve Corps as required by law, liberal credit being given toward the other two years for service rendered as an officer during or since the World War. This minimum period, and the service credited thereto, allow an opportunity for promotion commensurate with the time available, interest, and inclination of the officer to apply himself to the acquirement of knowledge of his profession, and also takes cognizance of experience gained in active service during the World War. It is not expected that all reserve officers will be able to qualify for promotion at the expiration of such period; length of service is but one factor in determining qualification for advancement. The actual period of service in any grade prior to promotion will depend upon the



capacity and industry of each individual officer as affected by the time that he can spare for military study and training.

An officer eligible for promotion is not considered therefor until he signifies his readiness to undergo the examination prescribed. An officer cannot be considered qualified to fill an office in the next higher grade until, by a suitable test, he can demonstrate his professional fitness therefor. Those officers who are eligible for promotion are encouraged to signify their readiness for examination when, but not before, they feel themselves reasonably qualified.

Decentralization requires that examinations be conducted by boards convened by the department and corps area commanders. However, in order to standardize requirements throughout all the corps areas, it is necessary that these examinations be conducted under War Department regulations prescribing their character and scope. At the same time, to provide the necessary elasticity to meet widely varying conditions, the examining boards prescribe the details of examination and are authorized to grant such exemptions, and to make such additional investigations, as, in their judgment, may be necessary or proper in any individual case. When their services are obtainable, reserve officers are to be utilized as members of examining boards.

Briefly, the conditions for promotion are: (a) A minimum of three years' actual or constructive service in the grade from which promoted; (b) a suitable assignment for the officer if promoted; (c) a demonstration of qualifications by examination.

For the information of the examining board and of officers to be examined, the scope which the professional examination may cover in the various sections of the Officers' Reserve Corps is stated in these regulations. The specific questions or tests to be applied are left to the discretion of the examining board as is also the manner in which the examinations are to be conducted. The examination in any subject or any part thereof may be oral, written, or practical, or a combination of these.

#### Professional examination—Part A.

(2) The basic subjects required for all officers being examined for promotion for "Special service" are as follows:

<i>Subject</i>	<i>General scope</i>
Administration	General knowledge of regulations as applicable to the officer as an individual; channels of correspondence; care and use of government property in so far as applicable to the individual.
Customs of the service, courtesy, and military discipline	An understanding of the most essential customs of the service and the courtesy expected of all officers; the purpose of discipline and the best means by which maintained.
Military hygiene	General knowledge of personal hygiene in the field and the conservation of the health of individuals and groups.

Practical efficiency. . . . Demonstration or estimated ability to put to practical use, in the capacity for which being examined for promotion, the knowledge possessed.

Professional examination—Part B.

(o) Medical Department. (For promotion to all authorized grades.)

*Section*

*General scope*

Medical. . . . . Organization and administration of the Medical Service in campaign; recent progress in medicine, surgery, and hygiene with special application to the military service.

*Assignment:*

So far as practicable, it is contemplated that a mobilization of the Army be one of organizations rather than of individuals. To accomplish this and to have all reserve officers understand and be prepared for their specific duties in time of war, all reserve officers will, so far as practicable, be given specific assignments in time of peace. All reserve officers are, in time of peace, under the administrative control of the commander of the department or corps area in which their permanent residences are located. With the exception of a limited number of reserve officers withheld by the War Department, or branches thereof, for special assignments to duties not pertaining to the organizations of a department or corps area, all reserve officers are under the jurisdiction of a department or corps area commander for the purpose of assignment.

As a basis upon which to make suitable assignments, the War Department records of each reserve officer are carefully examined by the chief of the branch in which the officer is appointed. The data having a bearing upon the qualifications, suitability, and preference for assignment is placed upon a form suitable for ready use. Except for the few officers retained for assignment by the War Department or branches thereof, the form bearing the assignment data is sent to the department or corps area commander by whom the officer is to be assigned. After the initial classification the forms containing the data bearing upon the officer's qualifications will be kept up to date by appropriate entries thereon by the assigning authority. The latter will afford officers a full opportunity for modifying their preferences and will take the necessary steps to make as complete and accurate as possible the data bearing upon the qualifications of each officer.

In making assignments, due consideration will be given to general and special qualifications, limitations as to the kind of duty for which appointed or suited, place of residence and local affiliations, and the preferences of the officers. So far as practicable, all reserve officers are to be assigned to units in the vicinity of their places of residence. However, World War veterans, who so desire, may be assigned to their reconstituted former war organizations in the discretion of department and corps area commanders. In all cases assignment must be within the department or corps area and departures from the general rule must not be permitted if administration, training, or mobilization will

be adversely affected. Upon a permanent change of residence a new assignment will be made if necessary, but officers will be retained in their original units or in higher organization of which such units form parts if consistent with the general principles stated above.

#### *Training:*

In order that reserve officers fulfill the purpose for which appointed, it is essential that they receive sufficient training and instruction in time of peace to qualify them for the performance of their duties in an emergency. The amount of training and instruction necessary varies with the experience, rank, and qualifications of individuals, and with the nature of the duties which they will be called upon to perform in an emergency.

The training and instruction of reserve officers divides broadly into two general classes: First, training when on active duty, and, second, training and instruction when on an inactive status.

In time of peace the maximum obligation for active duty for reserve officers is 15 days in any calendar year. However, reserve officers can be ordered to active duty only within the limits of funds appropriated by Congress for this specific purpose. The training projects and programs of the War Department must necessarily be prepared and announced from time to time as appropriations are made. Having in view the limited funds available and the desirability of giving all reserve officers approximately equal facilities for training, the granting of individual requests for training at a particular time cannot, in general, be approved unless they accord with approved training schemes. Should any officer be called for the 15-day training period, he may be exempted from such training if special circumstances warrant.

Within the limits of funds and accommodations available, reserve officers will be authorized to attend the various service schools. The attendance at such schools is to be regulated so as to cause a uniform distribution throughout the Organized Reserves of officers who have attended such schools.

Reserve officers who also hold commissions in the National Guard will receive their training as officers of the National Guard and will not be included in such training projects as may be provided for other reserve officers.

The next resource which presents itself for developing the Medical Reserve Corps organization is found in the training centers for the Organized Reserves in each geographical corps area. The possibilities of these centers are prodigious. At the present moment the project contemplates only the assignment of a few medical officers and enlisted men of the Regular Army, Medical Department, to each center, but it is hoped to enlarge the units at a later date. These units represent the nucleus around which can be built up sufficient organization to meet the needs of the area in training the Organized Reserves, both officers and men. At these centers the Medical Department personnel will have the problems of hospitalization, sanitation and physical examination

and development of all troops and reserves who may be assembled, and in addition the special problems of training the reserves of its own corps. This will require an able and tactful executive with an efficient corps of epidemiologists, professional specialists and tactical instructors. It will probably develop as necessary as well as advisable to utilize the services of Medical Reserve Corps officers to a great extent for these duties whenever, for the short periods permitted by the law, great numbers of reservists of all branches of the service are assembled. This will not only give Reserve Medical Officers practical military experience but will develop teamwork and cooperation between the reserve and regular components of the United States Army.

The officers of the Medical Corps of the Regular Army have still another magnificent opportunity to penetrate into the area of the civil profession and win the cooperation of the Medical Reserve Corps in the American system of nationalization of our reserve. This path lies through the organization of the reserves into actual military units. As we have seen in our study of the American Reserve System, this nation has now undertaken the organization of divisions, brigades, regiments and in short all tactical units essential to the mobilization of organizations rather than individuals in time of national emergency. For this purpose officers of each arm and branch of the Regular Army are now being detailed to the Division Headquarters of these potential divisions. The staff of each of these division commanders will include one or more medical officers who will advise and assist their division commander in the development of the organization. The medical officer who is given this duty will have an excellent opportunity to achieve the cooperation of the corps of Medical Department Reservists allocated to his divisional organization. Every effort must be his to develop *esprit de corps*, mutual esteem and fellowship among the medical officers of his division. This will in practice be an important measure in the development of the Medical Reserve Corps system. A medical man may have a very faint allegiance to a somewhat intangible corps of which he is a potential atom, but, if he be at all human, will take a very direct and personal interest in a divisional organization developed in his own town or district among his friends and daily associates. There is no better means to bring home to Americans the fact that this is in reality an organization of the American people for their own personal welfare and safeguard than can be obtained through the local coloring of actual formation of reserve units of reserve divisions in each city, town and hamlet in the United States.

The National Defense Act provides for still another type of military training among the civil population through its authorization of Civilian

Training Camps. These may be compared in principle to the "Plattsburg Idea" which was a potent factor in developing military training and interest in national preparedness in the days preceding our participation in the World War. Through these camps as through the Plattsburg camps and through the training centers, the Medical Reserve Corps can be developed and extended by judicious functioning, especially since much of the hospital and sanitary work, as well as instruction in tactical work, can and will be performed by Medical Reserve Corps Officers.

Thus far consideration has been given chiefly to instruction of Medical Reserve Corps Officers at their own camps and universities. In addition to these opportunities the American system provides for the voluntary attendance of the Medical Reserve Corps Officers at the Army Special Service Schools. The schools now in operation which are thus opened and appeal to the Medical Reserve Corps Officer are the Army Medical School at Washington, D. C., and the Medical Field Service School at Carlisle, Pa. At the present time the former holds a six months' basic course which begins with the calendar year, and the Field Service Schools gives a four and one-half months' course which begins in August. The two courses are complementary and so arranged that attendance on the field service course is introductory to the basic course at the Army Medical School. The field service course is especially designed to give instruction in tactical problems, field training and field sanitation and is especially suitable for the military instruction of newly appointed medical officers and reservists who have not had much active service. The course at the Army Medical School is in the main a postgraduate medical course in which special attention is devoted to sanitation, biological laboratory work, roentgenology, tropical medicine, surgery and army administration. In addition to these basic courses the Medical Department of the Army conducts special courses of shorter duration at the Army Medical School in epidemiology, laboratory work and roentgenology and at the Field Service School in Reserve Officers' Training Corps instruction and allied subjects. The Medical Department of the Army will undoubtedly expand the usefulness of these two schools as far as possible as a means of developing and extending its influence with the Organized Reserves and its training plans for the Medical Reserve Corps. These schools also serve a large function in standardizing the courses for Reserve Officers' Training Corps and training camps and thus indirectly assist in the development of the Medical Reserve Corps. The attendance of reservists upon the service schools depends upon the will of the reservist and the public funds appropriated for this purpose. It behooves the Medical Depart-

ment of the Army to make these courses attractive to the Medical Reserve Corps since the pressing desire of reservists for such courses will certainly result in increased opportunities for their instruction, and in this way one more link unifying the reserves and regulars will be forged.

The story of the Medical Reserve Corps of the Navy and its present status may be briefly summarized somewhat as follows:

The Medical Reserve Corps of the Navy was authorized by law in 1912 and was at that time fashioned very much after the then existing law for the Medical Reserve of the Army. In August, 1916, Congress passed an act which gave the Navy a very much wider scope for the formation of a Naval Reserve. Under this Act, which extended to both line and staff, six different classes of reservists were authorized. Of these six classes, all but one applied to former officers or enlisted men of the Navy, and a retaining pay was given to these classes in return for certain obligations for service and training. The sixth class was designed for civilians who voluntarily enrolled for service in time of national emergency. For the sixth class, no retaining pay was given unless on active service, nor was there any absolute obligation to active service except in time of national emergency. In the Medical Section, officers were commissioned in the three grades of lieutenant, junior grade, lieutenant, and lieutenant commander. An appointee could be commissioned in any one of the three, but promotion was not ordinarily made except on second enrollment and usually in recognition of several months' training on active service. Aside from voluntary training and such training as could be derived by correspondence and supply of Navy Manuals, the civilian reservist was given none. The Navy, like the Army, used these civilian appointments, which were of four years' duration, as a means to secure the allegiance of selected and usually distinguished members of the civil profession. Before the World War, it is probable that the Navy had enrolled in this way in its sixth class approximately 500 doctors, although the number on active service during the war quadrupled that number.

After the armistice the number of reservists gradually receded until the present writing when the number is again probably about 500. In September of 1921, due to lack of funds, the Secretary of the Navy disenrolled Classes 2 to 5 inclusive so that at the present time only Classes 1 and 6 remain. Of these two, only Class 6 interests us in this paper. It is understood that the Navy is now studying the whole question of reservists and will as a result seek legislation if necessary to give a more satisfactory status to the Navy Reserve. It is not unreasonable to assume that the Navy will secure legislation which will in a measure make provision for its reserve personnel along much the same lines as

enacted for the Army with such modifications as are necessary to its especial problems. It is with this probability in mind that this study is devoted in very great part to the consideration of a reserve for the land forces, since the principles developed by the Army will be found equally applicable to the Navy.

The Public Health Service completes the triad of the Medical Reserve Corps systems of the Government. Its reserve is based upon legislation similar to that originally enacted for the Army and Navy. The reserve for the Public Health Service has a most fortunate relationship to the Medical Reserve Corps of the Army and Navy in that the period of maximum requirement of the Army and Navy does not necessarily nor usually coincide with that of this sister service. Thus at the present epoch, as the demand upon the military and naval medical departments in the care of the sick and wounded of an Army and Navy of nearly 6,000,000 men has gradually lessened, the responsibilities of the Public Health Service in the care of U. S. veterans has rapidly risen. The Public Health Service has found that medical personnel trained by the Army and Navy is invaluable in its own tremendous task, just as in time of public emergency the Army and Navy cannot hope to find more valuable personnel than that trained in the Public Health Service. The three services are thus linked by a bond of common service of the highest value to the nation. This bond is not only of value to the operation of the three services, but is also a notable resource to many patriotic doctors who in time of public emergency have sacrificed their private interest to the public weal and have later returned to their former homes only to find their clientele irretrievably lost. To these men and to those who through public service have become interested in this work, the peace-time demands of an expanding public health service furnish a welcome appeal.

It is conceivable that as these three reserve systems develop, and as the mutual nature of their interests becomes more clearly apparent, even closer bonds will be established among them. At the present time the Medical Department of the Army recognizes the military value of the training received by reservists in the Public Health Service and does not hold that membership in the Reserve of the Public Health Service shall debar membership in the Medical Reserve Corps of the Army. The day will come, no doubt, when the Medical Reserve Corps systems of the Government will be so developed, extended and mutually cooperative that the service having the maximum demand can take, as it were, from the common pool of reservists that number necessary to its requirements. When the coordination of the Medical Reserve Corps Systems of the three services is fully perfected the Government will possess a

Medical Reserve in the American medical profession organized and ready to meet any national emergency, whether it be pestilence, foreign foe, or civil strife.

Many years ago, as an observer unaffiliated with any of the public services, I spent a month in the camp and mess of a representative group of officers of the Army, where I heard many discussions of the state of military unpreparedness of the United States and was much impressed with the sincere belief of these officers that the American people were in every sense unprepared to meet a great war. Upon leaving that camp I chanced to visit the great industrial centers of New York and Pennsylvania, and as I watched their stupendous industrial activities I was reassured in my own mind and heart as to the latent power of the American nation to meet any demand which war might bring.

The World War, which brought the American people into direct relation with the military organization, had also the inestimable advantage of bringing the Regular Officers into direct contact with the civil population. From this relationship a new conception has been born in the minds of our military students of the almost infinite potentialities of our national life, and as a result they have for the first time subscribed to a national military policy of a Citizen Reserve. That such a reserve can form an effectual reserve depends fundamentally upon the general participation of American citizens.

In this study of the measures to develop this Reserve Army in one single branch of the Reserve Corps, I have intentionally avoided attempts to create a novel or original scheme, for the reason that we are now taking the first steps in a new and wonderful national military policy. I have endeavored, on the contrary, to stress the opportunities presented by the National Defense Act and the regulations published in relation to this Act and the benefit which may be achieved by linking up these provisions with the existing medical associations and schools and the great body of the medical profession of America.

In dwelling at some length upon the subject of war possibilities, it may be thought that I have wandered from the subject in hand. Nothing could be further from the truth. No measures will avail for developing and extending any military reserve in the face of the apathy of a people who do not believe in its need. Even hostility is better than apathy, since the enemy is at least interested and may through that interest be met. The prime measure, therefore, is the interest of the medical profession in a Military Reserve, and that must be predicated upon demonstrated need of a reserve. At the present writing the Army Medical Department has approximately 10,500 reservists, of whom only 5,550 are doctors. Nearly 4,000 are members of the Dental Reserve



Corps. When the Medical Reserve Corps of the Army has enrolled only 5 per cent of the doctors of America, it means that the profession is not seriously interested in the proposition. There are many individual reasons and classes of reasons why former reserve officers are not now enrolled, but the great and fundamental reason is that the average American doctor does not appreciate the considerations which led his representative in Congress to provide so carefully and generously for this important national safeguard. It is admissible that there are many hundreds of doctors who served voluntarily and nobly in the World War who now entertain personal grievance towards the service, but it is not conceivable and it is not true that any appreciable number would withhold their services if their country were again endangered. The medical profession of America was not appreciably organized for a great war when war came. In the magnitude of the resulting confusion the individual frequently suffered grievous wrong and injustice. But now the American people have so legislated that a Citizen Reserve is being organized, in Lincolnian paraphrase, "By the People, for the People and of the People."

This reserve will be developed into organizations of reservists, officered and controlled by reservists. I reiterate, therefore, in closing that of all measures to organize and develop the Medical Reserve Corps systems of the Government, the basic one is to convince the medical profession of America of the need of a reserve and the opportunity inherent in the present military policy of the United States.

In general, some training and instruction while on an inactive status will be necessary to replace, or to supplement, training received while on active duty. This will, in general, take the form of instruction by Regular Army officers detailed for duty with units of the Organized Reserves, of correspondence courses, or of study engaged in by the officer himself. Organization commanders, department and corps area commanders and chiefs of branches have a mutual responsibility in accomplishing the training and instruction of reserve officers and will, from time to time, afford these officers such facilities for training and instruction when on an active status as circumstances permit. Within the limits of funds that may be utilized for this purpose, the War Department will make available for the use of reserve officers such official publications as are necessary or desirable for their instruction.

The question of training reserve officers is one of the most perplexing of the many difficult problems in the development of a Citizen Reserve. The great body of men in civil life have not time to devote a measurable portion of the calendar year to military instruction even if public funds were available for this costly project. The War Department must therefore look to prior military experience or training in its Reserve

Officers' Training Corps units for the basic education of its reserves, and thereafter seek to keep its reservists reasonably informed upon military affairs through its officers assigned to units of the Organized Reserves; through military publications; through correspondence courses; through the attendance of reservists at military camps or service schools; and, in brief, through every attainable means of reaching the attention and interest of its reserves.

## RESERVE OFFICERS' TRAINING CORPS

### SEC. I.—*General Principles*

The primary object of the Reserve Officers' Training Corps is to provide systematic military training at civil educational institutions for the purpose of qualifying selected students of such institutions for appointment as reserve officers in the military forces of the United States.

Although the primary object of the Reserve Officers' Training Corps is, as stated above, to produce trained officers for the Officers' Reserve Corps, it is recognized that the basic military training received by students, who for various reasons fail to complete their qualification course for the reserve corps, is of considerable military value to the Government.

The Reserve Officers' Training Corps will add to the educational resources of schools and colleges and will give to the student a training which will be as valuable to him in his industrial or professional career as it would be should the nation call upon him to act as a leader in its defensive forces.

A military unit is largely dependent for its efficiency upon the physical fitness of the individuals composing it. Physical training, therefore, will form an essential part of the military instruction. The military department will cooperate to the greatest possible extent with the physical training department of the educational institution.

### SEC. III.—*Control*

General supervision of the Reserve Officers' Training Corps will be exercised by the War Department. All communications to the War Department relative to the Reserve Officers' Training Corps will be addressed, except when otherwise specified, to The Adjutant General of the Army. Control and direction of the Reserve Officers' Training Corps within each department or corps area will be exercised by the commanding general thereof. The latter will also supervise the military instruction and training in all civil educational institutions within his department or corps area, including institutions operating under section 55c, act of June 3, 1916, as amended, and under section 1225, Revised Statutes.

Chiefs of branches represented by Reserve Officers' Training Corps units will by such inspections as may be necessary, by reference to available periodical and special reports of Reserve Officers' Training Corps activities, and by direct correspondence within the authorization of paragraph 8, General Orders No. 75, War Department, 1920, keep

themselves informed of the conduct of instruction and training and of the status of efficiency units of their branch, and will make such recommendations to the proper office as may be necessary or desirable for the purpose of increasing the efficiency of units of their branch.

The officer in charge of Reserve Officers' Training Corps affairs at the headquarters of a department or corps area is a staff officer of the commanding general and acts as his representative. He should be thoroughly conversant with the history of military training in civil educational institutions and the past and present policy of the War Department with reference to such training. He should be charged with the coordination of military instruction and training at all civil educational institutions within the department or corps area, including institutions operating under the provisions of section 1225, Revised Statutes, and section 56, act of June 3, 1916, and with seeing that the policies with reference to the same are carried out. He should see that institutions are properly equipped to carry on the instruction and training prescribed by the War Department. He should make two inspections per year of all institutions within the department or corps area. During these visits of inspection he should endeavor to become personally acquainted with the officials of the institutions and the army officers on duty thereat and should furnish constructive advice and suggestions whenever practicable. He should refrain from interference with schedules in operation or with local affairs except where there is a failure to carry out policy or where wrong methods are in operation. He should encourage great latitude and freedom as to methods on the part of the professors of military science and tactics who should be held responsible for results. His office should not become burdened with administrative functions, nor should it request unnecessary and burdensome reports and data from the institutions.

Civilian heads of educational institutions in which units of the Reserve Officers' Training Corps are established will retain the general authority of supervision and control over the military department which they ordinarily exert over other departments of the institution.

#### SEC. IV.—*Conditions of Service*

Eligibility to membership in the Reserve Officers' Training Corps shall be limited to students at institutions in which units of such corps are established who are citizens of the United States, who are not less than 14 years of age, and whose bodily condition indicates that they are physically fit to perform military duty or will be upon arrival at the age necessary for appointment in the Officers' Reserve Corps.

a. Whenever an institution has, or can provide, the necessary medical personnel and facilities to determine physical fitness by conducting the physical examination of candidates for admission to the Reserve Officers' Training Corps, it is the desire of the War Department that it do so.

c. It is desired that all members of the Reserve Officers' Training Corps be protected from typhoid and paratyphoid fevers and from smallpox by the necessary prophylactic vaccines while at the institution, in order to avoid the loss of valuable time from the limited schedules at summer camps, as a result of the administration of the prophyl-

lactic treatments to those who may elect to attend them. As members of the Reserve Officers' Training Corps are not soldiers, the administration of prophylactic vaccines cannot be made compulsory, but no student will be permitted to proceed to a summer camp who has not already been protected from the diseases mentioned or who declines to pledge himself to submit to the administration of the same upon his arrival thereat when taking the physical examination made by the camp medical authorities in compliance with Special Regulations No. 65b. Free triple typhoid prophylactic material may be obtained upon the request of a professor of military science and tactics to the Commandant, Army Medical School, Washington, D. C., stating the number of students that it is desired to protect. Smallpox vaccine will not be furnished by the War Department.

With the approval of the authorities of any institution, physically fit members of the faculty or of the corps of instructors are authorized to take the courses of training prescribed in these regulations for members of the Reserve Officers' Training Corps. However, it must be understood that participation in these courses does not entitle them to enrollment in the Reserve Officers' Training Corps nor to participation in any government expenditures therefor. Faculty members are urged to secure appointments in the Officers' Reserve Corps by complying with the law and regulations governing such appointments. Certain members of the teaching staff with military experience may be appointed faculty military instructors on the recommendation of the professor of military science and tactics, with the consent of the head of the institution.

The importance of the Reserve Officers' Training Corps has already been cited and, as we have just seen, offers the War Department the best field in time of peace for imparting basic military instruction to the civil population. A few paragraphs from War Department Regulations No. 44 of July 6, 1921, dealing with this corps, are of especial interest to those concerned with the development of any branch of the Officers' Reserve Corps.

#### SEC. VI.—*Duties of Officers*

The senior professor of military science and tactics on duty at an educational institution will be the head of the Department of Military Science and Tactics and will be designated as the professor of military science and tactics. He will have the academic rank which the institution accords the heads of its other departments. He will be a member of the university, college, or school faculty, and as such he will be entitled to all the rights and privileges of a faculty member and will assume the same responsibilities and obligations as heads of other departments.

Upon request of the head of the institution, reports on the status of military training will be furnished by the head of the department of military science and tactics.

A system of grading similar to that in force in other departments

will be maintained by the department of military science and tactics, and reports will be submitted whenever called for by the authorities of the institution.

#### SEC. VII.—*Training*

The course for the senior division will have for its primary object the training of students, so that at the termination of their instruction they will possess the following essential qualifications of a junior officer; (a) A good general education; (b) a good special education in the academic requirements of the branch concerned; (c) a well-disciplined body and mind; (d) basic and special military training pertaining to the branch concerned.

Students electing Reserve Officers' Training Corps work do so for only two years at a time. The first election is for the two years' basic course, after which, if the student is recommended for further training, he may elect the advanced course for the remainder of the college course. Completion of either course shall, when entered upon by a student, be a prerequisite for graduation as regards such student unless in exceptional case he shall be discharged from the Reserve Officers' Training Corps by the professor of military science and tactics for sufficient reason with the approval of the head of the institution.

Two summer camps will normally be held—a basic camp and an advanced camp. The basic camp may be attended or not, as the student may elect, and if elected, may be attended at the end of the first or second year of the basic course. One advanced camp is compulsory for students who enter the advanced course, and it will be attended after completion of the basic course and enrollment in the advanced course. The period of instruction at camps will be properly divided between training in the fundamental military subjects and training in the special technical subjects in the branch concerned.

Transportation, subsistence, uniforms, equipment and medical attendance will be furnished members of the Reserve Officers' Training Corps attending summer camps. Members of the Reserve Officers' Training Corps authorized to attend advanced Reserve Officers' Training Corps camps will be paid during the period of such attendance at the rate prescribed for soldiers of the seventh grade of the Regular Army.

When any member of the Reserve Officers' Training Corps has completed two academic years of service in the senior division, or has taken a course prescribed for the senior division distributed over a corresponding period of time and has been selected by the president of the institution and the professor of military science and tactics as qualified for further training, he may be admitted to the advanced course of the senior division.

Any member of the senior division who executes a written agreement for admission to the advanced course as shown in paragraph 98 of these regulations will be entitled, while not subsisted in kind, to the commutation of subsistence fixed by the Secretary of War in accordance with law.

The minimum number of hours of Reserve Officers' Training Corps instruction and training required to be given in the basic course is three hours per week and in the advanced course five hours per week with the

exception that the minimum required number of hours for medical, dental and veterinary units is three hours per week in both the basic and the advanced course.

The daily instruction periods should be coordinated with the college schedule and correspond to the hours of the other departments. Hours should not be assigned in such manner as to encroach upon the time normally reserved to the student for study, athletics and recreation. An arrangement of staggered periods throughout the day should be sought which will furnish small groups for instruction. The assignment of instruction periods on Saturdays should be avoided.

Every effort will be made to secure cooperation between the military department and the other departments of the institution. For example: The history course in the college may be utilized so as to give all the necessary instruction in the military history of certain wars to the students taking the military training course. The subjects of hygiene, camp sanitation, etc., may be taught by the professor of hygiene. First-aid instruction may be carried out by instructors in the medical college. Considerable assistance in the conduct of military law and military engineering courses can be given by the law and engineering departments of the institution.

At the present time twenty of the leading medical, eight dental and three veterinary schools have established Reserve Officers' Training Corps units with a membership of nearly 3,000 students. The Medical Department of the Army recognizes the invaluable resource for fundamental military training provided by the establishment of these units and will exert every endeavor to multiply the number of units and student enrollments.

Thus far we have considered the general question of the necessity for a reserve, the laws authorizing an Officers' Reserve Corps and the interpretation placed upon these laws, together with present plans for the development of this corps. This brings us fairly to the direct question of what measures we shall favor for this development and extension of the Reserve Corps System, especially in its application to the medical fraternity.

Broadly speaking, it is the part of wisdom at this time to utilize the agencies provided by the Government in conjunction with existing medical organizations and educational institutions, rather than to attempt to create new systems or devices to attain our purpose. The law has provided the framework of an organization, and the Army and Navy are more than willing to supply the necessary machinery in the shape of commissioned and enlisted instructors and equipment. The one essential element required to make the Officers' Reserve Corps a national institution is the widespread participation upon the part of representative Americans. To attain this the Army and Navy must win and maintain public interest, confidence and sympathy. Public

interest can be secured by no other means than judicious publicity; confidence only by consistent fair dealing and sympathy through fellowship and association in the cause of national security. Applying these phrases to the practical problems of the Medical Reserve Corps they mean that we must have the good will and support of the press, particularly the medical press, for our publicity; we must be guided in dealing with the Medical Reserve Corps individually and collectively by a recognition of the certainty that only an unflinching policy of fairness and equity to all can restore and retain the trust of the medical profession of America; and we must seek in every way to obtain the cooperation of the Reserve Corps in our common labor in the problem of national preparedness.

The support of the press, both general and medical, is not difficult to obtain when it is entirely evident that the purpose sought is for the general good of the people. The press, taken as a whole, is a remarkably accurate barometer of the public confidence. While it is true that the press often forms public opinion, it is even more generally a fact that the popular verdict governs the attitude of the press. When, therefore, it is manifest that the Reserve Corps is the Reserve Corps of the American people, created and operated in the public interest and for the commonwealth, the press will be at the service of the corps. If, on the contrary, we revert to the past error of a military caste operated for the interests of the few, we correspondingly lose our influence with the press.

There are several direct measures that we can take which in small but definite degree tend to gain the favor of the medical press. One of these is by furnishing matter and another by furnishing readers who demand that matter. Journals can only live by matter of interest to a supporting group of readers. It is therefore the duty of the Army and Navy, active and reserve, to supply the medical press with articles and news items—in brief pabulum acceptable to an increasing number of readers who are interested in them or who may be gradually led into such an interest. Rome was not built in a day. Neither can we expect the Medical Reserve Corps to attain full growth simply because a law is passed. We must build up stone by stone an organization which will command the continued assistance of the press through the integrity of its purposes and the national character of its membership. All good commanders know that the habit of leaving the execution of details to an indefinite group is fatal to an enterprise. It is not enough, therefore, for us to agree that the support of the medical and lay press must be won. The Medical Reserve Section of each corps area must select at least two officers who shall strive for proper publicity with a view to public interest in the Medical Reserve Corps. One of these officers

should belong to the Regular Army and should be on duty in connection with the Organized Reserves. The most suitable selection ordinarily should be an officer of the Medical Corps on duty at the Corps Area Headquarters in charge of the development of the Organized Reserves in his corps area. This officer, through his relations with the War Department, the Corps Area Headquarters, the Corps Area Training Center, the supervision of Reserve Officers' Training Corps units and the assignment of Medical Reserve Corps officers in his area to tactical units, will be in an admirable position to secure and collate information of general interest to the members of the Medical Reserve Corps in his area and to the members of the profession and the public generally. This officer directly, or preferably through liaison with one or more suitable officers of the Medical Reserve Corps for the medical press and of other branches of the Officers' Reserve Corps for the lay press, should seek publication judiciously in respect to quantity and quality. The advantage derived from this connection is that the Regular Officer is in a better position to obtain information and the Reserve Officer is in a better position to appreciate what matter will be acceptable to the press and the public. The foregoing plan is only one of several which may be readily conceived by the imagination, but the essential thing is to place direct responsibility upon designated officers in each locality to obtain in tactful and decent ways the support and active help of the medical and lay press.

Of equal if not greater importance than the assistance of the press is the good will and favor of all recognized medical societies and associations, especially state and county medical societies. The corps area supervisor of Medical Reserve activities must give especial thought to these organizations. Their support is of inestimable value to the cause of the Medical Reserve Corps, and their hostility will retard success in their sphere of influence. Furthermore, by close relations with the accepted medical associations, the corps area supervisor can sense the opinions of the leading professional men and can form a far better estimate of the Medical Reserve officers whom he must assign to important professional and tactical positions. He must, however, be on his guard above all things that he does not become partisan in any local difference, whether between societies, schools of thought or individuals. He must therefore maintain a neutral position suited to the judicial character of his duties and deal preferably through the official representatives of organizations since the officers represent manifestly the will of the majority. These medical associations, if thus approached in a fair and impartial way, will not only react favorably to the general cause of the Medical Reserve Corps but in time of public emergency will be



found to be the best counselors and nearest friends that the public services have in their call for help from the unorganized medical profession of America.

While the corps area supervisor of Medical Reserve Corps activities can thus do much personally to attain the invaluable aid of the established medical associations, he can do still more through impressing the importance of this relationship upon all officers on duty with the medical units of the Organized Reserves whether at Reserve Officers' Training Corps units, Training Centers or elsewhere. He must not permit the retention on duty of this nature of a medical officer of the Regular Army who cannot maintain harmonious and agreeable relations with the constituted societies, the Medical Reserve Corps officers and the medical profession generally in his area of activity. The importance of this relationship has already been realized by the present Secretary of War, who, on December 7, 1921, by order charged chiefs of the various branches of the Regular Service with personal responsibility for the officers they assigned to duty with the Organized Reserve units.

It now is and certainly must continue to be the policy of the Surgeon Generals of the Army, Navy and Public Health Services to encourage friendly relations between medical officers of the Regular Establishment and the medical associations and the profession generally. There are strong reasons why the Regular Medical Corps should seek this relationship. In all times of stress the Regular Corps must look to the civil profession for assistance. At all times the leading men in the civil profession have shown their readiness to stand by the medical departments of the public service and with scarce an exception have shown willingness to extend legitimate assistance to individual officers of the Medical Corps of the Army, Navy and Public Health Services who have sought their cooperation and assistance. There is no fundamental basis for rivalry or permanent difference between the civil and military medical men. On the contrary, they spring from the same source and have basically the same broad and public-spirited interests. The old era of military insularity and clannishness must give way without delay to a more catholic relationship with the general medical profession in order that the Medical Departments of the Army, Navy and Public Health Services may attain the goal of a general participation by the medical profession of America in the Medical Reserve Corps systems of the Government.



## A PROPOSED NEW FIRST-AID PACKET

A STUDY FROM THE MEDICAL DEPARTMENT EQUIPMENT LABORATORY,  
MEDICAL FIELD SERVICE SCHOOL, CARLISLE BARRACKS, PA.

BY JOHN P. FLETCHER, DIRECTOR  
*Major, Medical Corps, United States Army*

(With six illustrations)

FROM all of the information I am able to gather, apparently one of the first deficiencies noted in the medical equipment carried by the American soldier when he reached combat in France was in the first-aid packet. Its principal outstanding shortcomings were: The extreme difficulty frequently experienced in opening the can to get at the dressing, that the dressing itself was too small for the type of wound most frequently met and that it did not possess sufficient absorbent capacity to be of much value.<sup>1</sup>

The metal containers in which these first-aid packets are put up are in two sections or halves stamped from sheet brass, the female half being scored around the edge approximately  $\frac{1}{4}$  inch from the edge, and the lip of the edge at the beginning of the scoring extending out and attached to a ring upon which traction is supposed to start to tear the metal along the scored line. As the male and female halves are soldered together, even though done by hand, it is quite impossible to limit the distance between the male and female halves to which the molten solder will flow and adhere to the two surfaces. The result is that in many instances practically the entire scored edge of the female half is securely soldered to the male half. Traction on the ring will result in merely tearing off the extending lip of sheet brass without any chance of tearing the edge of the female half along the scored line. In many instances the ring itself would pull off from the lip of sheet brass, owing to the weakness of the soldered joint by means of which it was attached. This difficulty was overcome by spot welding the brass lip around the ring, and while this makes it practically impossible to separate the ring from the opening strip, it does not prevent the opening strip from tearing off when the tear reaches the solder.

I am told by officers with extensive front-line service that many men were brought into sorting stations clutching this packet in one hand, unopened or but partially opened, due either to the fact that the edge of the female half of the can refused to tear along the scored line on account of the solder, or that it tore off immediately, or that, because of the traction necessary to tear this metal along the scored line (due to the

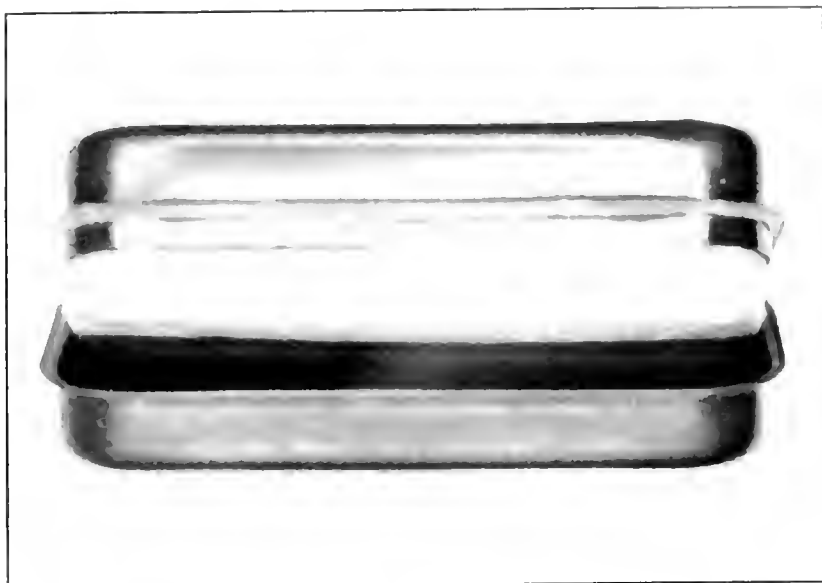


FIG. 1 First aid packet. Tape removed and shells separated to show dressing.



FIG. 2 1, the piece of 12-20 gauze in which the pad is wrapped; 2, the non-absorbent cotton, 100 grams; 3, the absorbent cotton, 100 grams; 4, the pad wrapped ready for stitching to the bandage; 5, the pad stitched to the bandage; the ends of the bandage have been cut off, beyond the stitching, the red paper can be seen through the bandage; 6, the complete dressing showing the wound surface; 7, the 6" piece of 1 1/2" bandage at the end of the pad; 8, the tails; 9, the red paper; 10, side view of the packet wrapped in germ proof paper; 11, front view of the packet; 12, the complete unit; 13, the male half of the shell; 14, the female half of the shell; 15, the non-corrosive steel tape; 16, the pad cut across its length in the middle. The black line represents the junction of the non-absorbent with the absorbent cotton. The fan shaped appearance of this cut section is due to the release of the cotton from the compression of the stitching at the end of the pad.



FIG. 4.—The experimental carrier.



FIG. 5.—Downward pressure by thumbs expels pocket which bursts by its opening tape to a hook in the pocket.



FIG. 6.—The pocket is grasped in the hand and pulled sharply away from the belt, removing the tape.



FIG. 7.—Tape removed, pocket ready for shells to be separated.

wide area of soldered joint), the wounded man did not have sufficient strength to open the dressing.

As I understand it, this packet was designed to meet conditions in warfare following the introduction of the small-caliber, high-velocity bullet. Two gauze compresses with attaching bandages were included, in order that both a wound of entrance and a wound of exit might be covered where a perforating wound resulted from the high-velocity bullet. Where a single perforating wound resulted from one bullet, fired from a hand rifle, and where no considerable hemorrhage was present, this dressing was, as far as I can learn, entirely satisfactory. But since the predominance of wounds in the late war were caused by machine-gun bullets, in which case not one but several bullets hit the same individual, or by fragments of high explosive shell, in which case a lacerated, penetrating, and not perforated, wound resulted, the first-aid dressing proved insufficient. It was therefore supplemented for front-line service by three types of dressings prepared by the American Red Cross and sterilized, packaged and distributed by the Army. These three Red Cross front-line dressings were essentially gauze-covered cotton pads to which bandages were attached.

The No. 1, or Red dressing, consisted of an absorbent pad 4 by 6 inches; the No. 2, or White dressing, of a pad 6 by 8 inches; and the No. 3, or Blue dressing, of a pad 8 by 10 inches, all with bandages attached, and packed with them were gauze wipes and tampons and one extra muslin bandage. These dressings, I am told, were very popular and very efficient during the war, the cotton pad furnishing not only greater protection for large or multiple wounds but greater absorbent capacity than the small gauze compress of the first-aid packet; also, on account of their size and bulk, they were more easily retained after application.

The first step in the revision of the medical equipment of privates and privates first class, Medical Department, which was published in Circular No. 377, War Department, 1919 (this was revoked by Circular No. 152, 1920, which continued the belt in service pending the development of the revised equipment), included four each of the No. 1 (Red) and No. 2 (White) Red Cross dressings, instead of either the present model first-aid packet or the individual dressing packet now carried in the Medical Department belt. This immediately raised the question, as to how this equipment could be carried in the field, and since it was realized that it was merely a temporary expedient pending further development of a first-aid dressing, it was finally decided to put these dressings in metal-ended cardboard tubes. It was realized at the time that this was a bulky package and without the degree of durability required as a permanent piece of field equipment, but it was believed in-

advisable to go to the expense of having special containers (which meant dies for their making) produced, owing to the fact that there were left over, after the armistice, but a few thousand of each of the three sizes. Work was, therefore, immediately started on the development of a new first-aid packet, bearing all of the above facts in mind.

At the very outset several more or less arbitrary dicta were set for this package:

First, it should form an acceptable substitute for the Red Cross No. 1 and No. 2 dressings, leaving the matter of a more extensive shell would dressing for future development.

Second, since every enlisted man in the Army is equipped with a canvas carrying device for the present metal first-aid packet, the outside dimensions of the new packet should be so limited that it can be carried in the present type carrying device.

There are, of course, great quantities of the present type first-aid packet in existence and there is practically no commercial outlet for them, so they must be used up by the Army to avoid an enormous loss. For peace-time service, maneuvers, training, etc., it is a perfectly satisfactory unit; therefore, with the present type packet continued in service with the present type carrying device, if the new packet could be accommodated in the present type carrying device, its immediate substitution for the present packet would be possible without any modification of the equipment of the Army. It was therefore expedient to hold the new packet down to the outside dimensions of the present type packet.

Third, the new packet should open by means of some sort of mechanical joint that is positive, requiring little effort and depending in no wise upon solder. It may be well to state here that after considerable discussion it was decided, based on experience with the various types of covering, to eliminate, for the time being at least, the consideration of anything but a metal covering for the new dressing. Rubber deteriorates rapidly in storage, paraffine injures fabrics, and no other acceptable substitute for the metal covering, that even approaches its durability, has as yet been developed.

With these facts in mind it was decided to produce a gauze-covered cotton pad attached to a piece of 44/40 gauze (rather than unbleached muslin) bandage, and since the Red Cross No. 1 was 4 by 6 inches and the No. 2 was 6 by 8 inches the provisional size decided upon was half-way between, that is, 5 by 7 inches. Experiment developed the fact that a 5 by 7 inch gauze-covered cotton pad attached to the middle of a 2-yard piece of 44/40 bandage gauze, so split as to make a four-tailed bandage, resulted in an apparently satisfactory dressing which could

be readily applied and easily retained on most any part of the human body.

It then remained to determine the type of container possessing the necessary qualities and, after the development of the container, to determine the amount of cotton that could be placed in this pad and compressed to go within the container. The experimental work on this container extended over a long period of time. Many devices and modifications were tried and discarded, until finally a brass shell consisting of a male and female half, each half presenting a bead to be held in apposition against a paper gasket by the crimping of a non-corrosive steel tape, was developed. As this type of seal, slightly modified, has been used commercially, with success, the next factor to be determined was the minimum dimensions consistent with safety in which it could be applied, since the projection of the bead and tape out from around the equator of the package would reduce the inside dimensions in length and width, and the maximum net inside measurements were desired, because of the outside dimensions being limited to the outside dimensions of the present type first aid packet. It was found that  $1/8$  inch on each side and each end would allow for ample sealing, which reduced the length of the body of the package from 4 to  $3\frac{3}{4}$  inches, and the width from  $2\frac{1}{4}$  to 2 inches, the thickness remaining the same as the present type first-aid packet, viz., 1 inch.

Experiments were then conducted to determine the maximum amount of cotton in the form of a pad 5 by 7 inches, which, together with a 2-yard piece of  $4\frac{1}{2}$  inch  $44/40$  bandage gauze, could be compressed to go inside this container, and which, upon removal, would return to approximately its original size without being matted, hard or lumpy ( $4\frac{1}{2}$  inches as the width of the bandage was taken to allow for economy in cutting from the bolt; for practical use there is no difference between a  $4\frac{1}{2}$ -inch and a 5-inch bandage). It was finally determined that approximately 500 grains of cotton could be incorporated in this dressing, and in order that the maximum absorbability of the absorbent cotton might be realized when the dressing was in place, it was decided to devote approximately one-fifth of this cotton capacity to a continuous layer of non-absorbent cotton over the back of the dressing. This will in no wise interfere with the softness or flexibility of the dressing but will interpose a practically water-proof seal between the absorbent cotton and the bandage by which it is applied, so that blood or wound discharges, instead of penetrating the center of the entire pad, which is what would normally happen, will be prevented from immediate penetration by this non-absorbent cotton and consequently absorbed by the absorbent cotton of the balance of the pad. Accordingly, this

pad was made up of a piece of 32/28 bleached gauze, 14 inches wide by 18 inches long, upon which was placed first the non-absorbent cotton, approximately 100 grains, and immediately upon this the absorbent cotton, approximately 400 grains. The selvage edges of the gauze were then turned and the gauze so folded that two thicknesses covered the absorbent cotton face of the pad thus formed. This pad was then placed on the middle of a 2-yard piece of 4½-inch 44/40 bandage gauze and stitched to this gauze across both ends, the stitching including the folded-in selvage edges of the gauze itself and both layers of cotton. This 2-yard piece of bandage gauze was then split into four equal tails beginning 6 inches beyond the stitch line of the pad, on both ends of the pad, and extending to the end of the bandage each way the result being: (1) the pad; (2) on either side of this, 6 inches of 4½-inch bandage; (3) the 4½-inch bandage split into two equal tails on each end.

In order that there might be no mistake as to which side of the dressing should be applied next to the wound, a piece of red paper, 4 inches square, was slipped between the bandage and the pad on the back or non-absorbent side of the dressing. This was easily held between the stitching at the ends and is easily removable without tearing. Printed on this red paper, in heavy-face type, appear the words "PUT OTHER SIDE NEXT TO WOUND." The legend was also stamped in the metal of the can "RED PAPER INDICATES BACK OF DRESSING. PUT OTHER SIDE NEXT TO WOUND." This dressing is folded across its length so that, in cross sections, it resembles the Greek letter Sigma. It is then compressed, wrapped in germ-proof paper and sterilized. After sterilization it is thoroughly dried. It is put into the can, the two halves of the can put together with a paper gasket between the two beads, and a piece of non-corrosive steel tape crimped around the entire can to hold these beads together. The end of this non-corrosive steel tape is left free for one inch, the last half of which is doubled and through which a ⅛-inch hole is drilled. This furnished ample grip by means of which the end of the tape may be seized, and actual test has demonstrated that 9 pounds of dead weight, without a jerk, will pull the tape off from the bead.

It was decided, before reporting this package for final adoption, to try out a number of them to determine: (1) Its serviceability, keeping qualities, etc., and (2) whether or not it could be built from our specifications. Accordingly, a contract was let on the following specifications, for 10,000 experimental packets, which have now been produced and which it is proposed shall be distributed to various selected units and organizations for a thorough trial. Some of them to be put in storage in various parts of the world.



## SPECIFICATIONS FOR FIRST-AID PACKET

*The Container.*—The outside dimensions of the container shall not exceed 4 inches in length,  $2\frac{1}{4}$  inch in width and 1 inch in thickness. It shall consist of two brass shells, each of which furnishes one-half of the cover for the contained dressing. These shells to be stamped from 30-gauge sheet brass and joined around the middle of the 1-inch face of the completed unit by a 26-gauge non-corrosive steel tape, operating to clinch together and seal the union of the two halves of the container, each of which will be provided at this point of union with a continuous bead on which the tape is applied. The bead on the two halves of the container will, with the tape applied, not project more than  $\frac{1}{8}$  of an inch above the surface of the 1-inch face of the unit. The tape will, after application, fit snugly, clear into the fold made by the turning back of the bead of the brass shells. The two halves of the container, for convenience designated male and female, will differ from each other in that the male half will, in addition to the bead above mentioned, have a flange of at least  $\frac{1}{4}$  of an inch, which will be a continuation of the side wall of this half of the unit. Said flange to be above the bead and so arranged as to slip readily into the female half of the container, thus bringing the bead of the male half in contact with the bead of the female half. The bead of the female half will be turned at the top edge of this half.

In closing this unit a suitable paper gasket will be slipped over the flange of the male half so that when the two halves are placed together this gasket will lie between the two beads. Sealing will be accomplished by the crimping of the non-corrosive steel tape over these two beads in such a manner as to press each bead firmly against the gasket between them. This tape must overlap itself at one end of the container the necessary distance along the edge of the container to insure good seal at the end. The outer end of this tape—that is, the end to be grasped for its removal—to be free from the bead 1 inch, the last half of which shall be of double thickness—that is, after the overlap sufficient to insure the seal has been made, there shall be  $1\frac{1}{2}$  inches of tape remaining. One inch from the point where the overlap ends (which point shall not be located so as to prevent the end of the tape herein described being flush with the long side, when flat and extended) this tape will be folded back on itself for a distance of  $\frac{1}{2}$  inch, the fold to be towards the container; both thicknesses to be perforated by a  $\frac{1}{8}$ -inch hole  $\frac{1}{4}$  inch from the fold. The container must be water proof, to be tested by complete submergence with the contained dressing for a continuous period of twenty-four hours in tap water at room temperature, without water entering the container. It must also withstand submergence over one-half of its length in tap water at room temperature for twenty-four hours, atmospheric pressure from within being relieved by a hole through the upper part of the container, not submerged, without water entering by capillary action. The tape must be applied to the bead in such manner that it can be removed readily, either by traction of the folded end of the tape, not to exceed a 10-pound pull, or with the hole in the folded end of the tape attached to clothing or equipment, by traction

on the packet itself not to exceed a 10-pound pull. The container shall be dipped in olive drab paint. One face of the container shall have appearing in raised letters, stamped in the metal, the legend:

**"FIRST AID PACKET, U. S. ARMY**

**Carlisle Model**

**To open: PULL TAPE**

**RED PAPER INDICATES BACK OF DRESSING,**

**PUT OTHER SIDE NEXT TO WOUND."**

Upon removal from the container the germ-proof paper must, in every instance, be intact, the dressing and paper must be throughout absolutely sterile, no water of condensation from sterilization or moisture used in compression must remain. Sterilization must be effected by dry heat or high pressure steam. The dressing will not be sublimated nor will any chemical disinfectant be added.

*The Dressing.*—The dressing to consist of a gauze-covered cotton pad 5 inches wide by 7 inches long, made up of a combination of absorbent and non-absorbent cotton, which shall total within 25 grains, more or less, 500 grains, and of which the absorbent cotton shall make up  $\frac{2}{5}$  of the total and the non-absorbent cotton  $\frac{1}{5}$ . A variation of not to exceed 20 grains either way on these proportions shall be permitted. The approximately 400 grains of absorbent cotton used shall be as per standard specifications herein marked Exhibit "A,"<sup>1</sup> in one continuous layer, and the approximately 100 grains of non-absorbent cotton shall conform to standard non-absorbent cotton, its basic stock to be of the same quality as the absorbent, this to be in one continuous layer, immediately next to the absorbent. The whole cotton pad to be completely wrapped in 32/28 bleached gauze, as per standard specifications herein marked Exhibit "B,"<sup>1</sup> the wrapping to be so done that two thicknesses of the gauze shall cover the entire surface of the absorbent cotton side of the cotton pad. In other words, the wrapping must go completely around the pad once, plus a second time across the face on the absorbent cotton side, which is to be the face of the pad placed next to the wound. The selva edges must be turned at least  $\frac{3}{4}$ -inch on the side the long way of the pad and across both ends of the short way; after the turning of the selva edges the pad is to be stitched firmly across both ends to the middle of a 2-yard piece of  $4\frac{1}{2}$ -inch standard specification bleached 44/40 bandage gauze, as per specifications herewith marked Exhibit "C,"<sup>1</sup> the stitching to be done so that it will include the turned selva edges of the 32/28 gauze covering the pad and the ends of its cotton filling, across its entire length. The 44/40  $4\frac{1}{2}$ -inch bandage to be split from each end towards the middle to within 6 inches of the stitch line on each end of the pad, into two equal tails. The bandage and tails to be rolled behind the pad, the whole wrapped in germ-proof paper and compressed to go within the container. Before packing there will be slipped between the bandage and the non-absorbent side of the pad so that it is held between the stitch attachments of the

<sup>1</sup> These specifications are the standard government specifications for absorbent cotton and bleached gauze.

pad to the bandage, a piece of bright red paper 4 inches square bearing the printed legend in heavy-face type: "PUT OTHER SIDE NEXT TO WOUND" printed side next to bandage so letters are visible through bandage.

In compressing, the pad will be folded so that in cross-sections it will resemble the Greek letter Sigma and the compression will be so done that upon removal from the container and germ-proof paper a simple pull from both rolled, tailed bandages simultaneously, will be sufficient to obliterate the folds of compression so that a smooth surface will be applied next to the wound. The absorbent cotton side of this pad must not be hard, stiff or lumpy, as a result of compression and sterilization.

If this first-aid packet develops as we hope it will, the manufacturing difficulties will have been overcome, the dies for its production will be in existence, and it can be immediately substituted in the present carrying device for the old packet, so that in the event of another emergency it could be put into immediate production and issued direct to the troops in the field without the modification of their equipment. Furthermore, the opening of the packet results in the destruction of only the non-corrosive steel tape, so that the two brass half-shells can be salvaged where any considerable quantity of them are used and these shells used again to cover first aid packets. This is a point not to be overlooked, since the fabrication of the shells and the metal in them is no inconsiderable part of the cost of any metal-covered first-aid packet.

In the meantime an experimental carrying pocket has been developed which, in size and appearance, resembles very closely the present type, except that the long axis of the can, instead of being carried parallel with the belt, is carried at a right angle to it. This new carrying device consists essentially of a flat, metal reinforced, canvas-covered back-board, against which the remaining five (5) sides of the pocket are held at the top and bottom. At the top, by a continuation of the top edge of the pocket with the back-board covering forming a flexible canvas hinge, and at the bottom by a lip-like extension of the bottom edge of the pocket which is fastened to the back board with a "lift-the-dot" fastener; the female element being in the lip, the male element on the back board. In the lower edge of this pocket is located a steel hook riveted to the canvas, which, in loading the pocket, engages the hole in the end of the tape on the first aid packet. To open the device, the first and second fingers of the opening hand are slipped under the flexible lip of the pocket, between it and the back board, in order to "lift-the-dot." The thumb naturally presses against the outside of the center of the face of the pocket. The "dot" being lifted, the lip is free to be raised, which raises the front of the pocket and its

contained first-aid packet, on its canvas hinge, away from the back-board. Downward pressure of the thumb in this position serves to expel the packet from the pocket by turning the pocket inside out. The packet thus released can be grasped in the hand, and a quick jerk will remove the tape from around the head since the end of this tape is held by the hook at the bottom of the pocket. The seal of the packet thus being broken by the removal of the tape during the same operation in which the packet is removed from the pocket, it then remains merely to separate the two halves of the packet and remove the dressing. In reloading the pocket the old tape is slipped off the hook and the hole in the tape of the new packet is engaged by the hook as above described.

The Equipment Laboratory acknowledges its indebtedness to Mr. G. T. Bauer and Mr. Otto Schulz, of the firm of Bauer & Black, for invaluable assistance in the conduct of experiments herein described.

As suggested by the Office of the Surgeon General in a recent communication, the Medical Department Equipment Laboratory would be grateful for any comments, criticisms or suggestions that the readers of the *MILITARY SURGEON* may see fit to make. These may be forwarded direct to the Medical Department Equipment Laboratory, Medical Field Service School, Carlisle Barracks, Pa.



## WAR TYPHUS

By ATTILIO M. CACCINI

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### HISTORY AND GEOGRAPHICAL DISTRIBUTION

THE SAD experience of the last war has added very little to our previous information on this chapter. The various epidemics that occurred throughout Europe during the war have more than ever demonstrated the precision of one of the names given the disease by its former observers, namely, that of "War Typhus"; in fact its appearance under an epidemic form has almost always been in strict relation with the development of wars of long duration. Cardano, Grazioli, Rasori and Fracastoro, foremost among others, have left us marvelous descriptions of the disease and of the various epidemics of the olden time. The first of these of which we have a real description broke out in 1489 among the troops of King Ferdinand the Catholic, at the siege of Granada. It is an established fact that the outbreak of the disease under epidemic form is favored by the overcrowded conditions and filth which are present among combat troops. During the last war, typhus appeared on the eastern front among the Russian troops and then found its way into Austria, Germany, Serbia, Roumania, everywhere spread by the Russian prisoners or refugees from the invaded territories.

Now that the theory of the autoctonous origin of the epidemics cannot be sustained in the light of the bacteriological discoveries, we must remember that this disease, like all others of an epidemic type, does not become extinct, but that during what we may call periods of rest it remains quite alive in certain centers, where it stays and thrives in an endemic form, constituting in this manner regular "foci." Such foci in Europe are permanently established in Ireland, in Scotland, in Brittany, in Valachia, in Volinia, in Galicia, in the Baltic provinces, ever carried around in sporadic form by the poorest pariahs of our civilization, the poor, the neglected and the underfed. From these centers the epidemics of the last war started. In the same way each invasion of Italy during the past 2,000 years has very likely established such foci. Here and there have remained traces of such epidemics, in the form of foci, which fortunately were unable to become active, owing to the unfavorable climatic conditions, which prevented the growth and the spreading of the carrier (the *P. restimenti*). Nevertheless one of such foci undoubtedly exists near Milano, toward the mountains, one of the coldest sections of the country. Now and then in that section there appear in a more or less extended form sporadic cases of

a new disease characterized by an exanthem much like that of measles, but which has none of its other characteristics. Likewise, now and then cases are reported in other provinces of a similar disease, among that part of the agrarian population fluctuating to and fro for the gathering of the different crops. Some such cases I remember having seen in Rome as far back as 1899 and 1901.

Judging from certain evidences, very probably all large cities in the world have small foci of the infection. In New York, since the famous epidemic of 1890, the attention of health officials and of medical bodies has been called to cases of exanthematous disease, which was clinically described by Dr. Brill and which for a certain time was even called Brill's Disease. Dr. Brill himself, later on, concluded that they were mild cases of typhus fever. In spite of the existence of such foci and of many conditions favorable for their breaking out in an epidemic form, the reason why this disease does not assume such serious proportions in peace time is probably due to the absence of those factors so prominent during war time; chief among these are lowering of the general resistance of the body and the increased virulence of the existing latent infection by the creeping among the poor classes of new and fresh virus.

Very impressive are the figures coming from the different centers of the epidemic; 150,000 deaths actually occurred in one section of Serbia. The whole Serbian Army was defeated by the epidemic creeping into its ranks from the infected provinces. Roumania fared no better. One point of particular importance to the medical class was the morbidity and mortality among medical attendants; 160 medical officers of the Serbian Army out of 340 detailed to the hospitals for typhus cases died of the disease. In Roumania Dr. Pepen saw all the sixteen medical men of a small hospital contract the disease and helplessly die. Great and prominent names figure among the victims in all nations, among them being the American, Dr. Ricketts, the Czech, Prowaczek, and the German, Jochman.

#### ETIOLOGY AND WAYS OF TRANSMISSION

We can now assert that, though the true nature of the specific agent of typhus is still unknown, this disease is produced by a fixed filtrable and transmissible virus.

All observers have remarked how the disease spreads, particularly in crowded places such as public dormitories, prisons, cheap lodging houses, concentration camps, etc. Another fact was well known, that the mere improvement in sanitary conditions and the enforcement of rules for personal cleanliness were sufficient to at least reduce the incidence of the disease, if not to entirely control the epidemic. For

instance, during the Crimean War of 1852-1854, the mere establishment of laundries and bathing accommodation diminished the incidence of the disease about 50 per cent among the English troops. The hypothesis that the disease was diffused by means of parasitic insects is by no means of recent origin, but it was in 1917 that Nicolle proved in an experimental way that the *Pediculus vestimenti* is actually the real and perhaps the only carrier of the disease. Nicolle, in classical experiments, first reproduced typhus in monkeys (chimpanzee) by intraperitoneal injection of blood taken from human typhus fever patients. He then obtained the infection of other monkeys by using, as carriers, lice which he had infected by having them bite on these infected chimpanzees. He later succeeded in infecting guinea-pigs too, and found that they give a characteristic febrile reaction, which, as we will subsequently see, is used for diagnostic purposes.

As in practically all other infectious diseases, a most extraordinary number and variety of microorganisms have been described, illustrated, isolated and cultivated from the blood, stools, urine and from different organs of patients and bodies of victims from typhus; many have actually been described as the specific virus of the infection. The most recent and perhaps the most enthusiastically received work was that on the anaerobic bacillus described by Plotz of New York, and with perhaps a little hurry named "*Bacillus anaerobic plotzii*." Later it was conclusively demonstrated that none of the microorganisms described is the specific virus of the disease, but one of them, the Proteus X-19, has assumed great importance in the study of the disease, as we will see in regard to the diagnosis and to the prophylaxis. Until of late, the only trustworthy experiments on the transmission of the disease from man to other are those of Nicolle and Conseil, who have proven conclusively that the virus is present in the circulating blood of certain organs (spleen, brain and suprarenal gland); that it is strictly connected with the white cells, that it can be infective even if administered in very small quantities, that the centrifuged blood (that is, the blood deprived of its cellular elements) very seldom can be infective, and that even then the infection can be transmitted only if the centrifuged blood is administered in large quantities.

Famous in the annals of medical history will remain the case described by Nicolle of a prison guard in Tunis, Northern Africa, who caused the death of a workman by jokingly putting on his neck a few lice taken from the body of a man who had just died of typhus. Nicolle succeeded in stamping out typhus from among prison inmates in the jails of Tunis merely by a systematic fight against the *Pediculus vestimenti*. Serbian medical officers have experimentally controlled Nicolle's

work by sleeping in the same beds with patients who had been cleaned of the parasites without ever contracting the disease. These facts are sufficient evidence of the preponderance played by this insect, at least in the etiology of typhus. We cannot yet positively exclude the possibility of other human parasites (such as the *Pediculus capitis* and the *Pediculus pubis*) being capable in certain conditions of transmitting the disease, though certain biological laws of a rather fixed character would point to an impossibility, and that impossibility may on its face be logically sustained by biological differential characters existing between the *P. vestimenti* and the two latter insects. In fact the *Pediculus vestimenti* feeds directly on the men by biting, whereas the *Pediculus capitis* and the *Pediculus pubis* feed on the secretion of the skin irritated by the presence of the insects themselves and their egg clusters, and by the scratching.

The most essential characters of the *Pediculus vestimenti* which may interest the physician, and particularly the clinician and the epidemiologist, for a rational fight against the disease, can be summarized in the following:

The optimum habitat of the insect is the clothing of men, and particularly the garments nearest the body. It may be found, though, in the hair of the arm pits and of the thorax. It goes to the skin only when hungry. The female, which is larger than the male, measures, when hungry and not fecundated, from 2 to 3 mm. in length, and 1.5 in width. After being fecundated it lays about 60 eggs for each six days of life; the eggs are laid in clusters much in the same way as those of the *P. capitis*; they are protected by a chitinous involucrum and are attached by means of a peculiar cementing substance to the wollen nap of clothing, and particularly along the seams. The most favorable conditions of temperature for the life of these insects is that of 30 to 35° C., and the optimum of life condition is the humidity which the human body affords. That is the reason why the insects live as near as possible to the skin. In an atmosphere colder and dryer than that of the healthy human body, the lice promptly show signs of distress and readily strive to migrate, as happens in the case of the death of the men hosts; if kept under experimental condition in a dryer atmosphere than that of the clothing nearest to the skin, he dies.

When kept at constant temperature and damp atmosphere that is its optimum, the eggs hatch within five or six days, and as the full-grown insect lives from twenty to forty days, it is readily understood how persons wearing woolen clothes, who cannot change them or even take them off, can house thousands of the pest. Russian prisoners oftentimes yielded over 10,000 lice, and the average cursory examination



of Russian prisoners yielded an average of 4,000 of the vermin. The hatching of the eggs diminishes considerably at a temperature below 30°, and 18 to 19° C. entirely arrests their hatching, though without actual death. At such temperature and below it the eggs remain in a stage of latent life, so that, if taken to a proper temperature, the process of hatching again begins promptly.

The full-grown insect finds its optimum temperature at 30 to 35° C. At this temperature it imperatively needs two or three feedings a day, otherwise it will die within twenty-four hours; below this optimum of 30 to 35° C. its movements become greatly reduced, all functions are retarded, and its life then is possible even with one feeding a day. At 0° C. the insect, like the eggs, passes into a state of apparent death, and can easily stand fasting for one week. In certain cases it has been known to survive at a temperature of 15° below 0° C. and yet return to a very active life as soon as taken near the skin of healthy men and animals, or as soon as the temperature was slowly and progressively raised. Higher temperatures are not as well tolerated, indeed when a person develops high febrile temperature the lice begin to migrate from the bodies, seeking other hosts; and here is one of the greatest dangers, because they are then already infected and readily transport the disease from the infected person to the healthy one.

The louse in fact, at 40° C., gradually begins to lose its vital instincts and functions, and if exposed to 50° C. it dies in a few minutes. At 60° the eggs are rapidly killed. 'Twenty minutes' exposure to a temperature of from 70° to 80° C. is sufficient to kill both insects and eggs. The insect can also live by sucking the blood of other animals.

If they fall on rough surfaces, such as wooden floors, for instance, they can walk and move with relative speed, particularly when not fed and in search of victims. In one minute they can walk 20 cm. They cannot move and walk on smooth surfaces, such as glass, dishes, smooth leather, raincoats, etc. A peculiarity of this insect is that it rapidly abandons the dead bodies, seeking again its optimum of life condition on the bodies of other animals or of men.

Keeping these characters in mind, one easily understands the mechanisms of the disease and its rapid spread; why the disease is essentially one of the poor classes; and particularly why it appears and best thrives in cold countries and seasons; and why it is relatively scarce or attenuated in warm countries or it practically disappears when the warm weather begins. It clearly follows that the disease is particularly frequent among persons wearing woolen garments, using woolen blankets, compelled to keep close together, unable to bathe and wash and to change clothing, and why it prefers places with rough

floors that are not easily washable, all of which conditions prevail among troops engaged in actual warfare, war prisoners and refugees. It is easy for the insect to travel the distance between person and person, and even to pass from one barrack to another. Its being abandoned for days in places of a low temperature by the moving of troops from one place to another is not sufficient to cause its death, for, as we have seen, its vitality is simply lowered under such circumstances until the arrival of a new body of men brings again to it an environment favorable to its existence. It follows that it is most dangerous to sleep on floors or within blankets or straw left by other persons, even if such persons have been gone for several days.

The louse is provided with a mouthpiece, or sting, which is very strong and through which it can suck about 1 cm. of blood at each feeding. The blood is kept in a liquid form in the stomach by virtue of the secretion of special glands. The insect defecates frequently, its dropping being of brown color. After each three or four defecations it needs further sucking if the temperature and humidity are at their optimum. Another study of the insect, the study of which is most important for an intelligent understanding of the prophylaxis, is that of respiration. The respiratory apparatus is formed by tracheæ, consisting of two tubes, one at each side of the body, with side openings, one for each segment of the thorax and of the abdomen; the openings or stomata are symmetrical.

The temporary closing of these stomata (which the insect can easily perform at will and does whenever its vitality is lowered or whenever it finds itself in an atmosphere permeated with odors or gases dangerous to its life activities) does not produce death, but only the temporary suspension of all outward appearances of life. This is the reason for the failure of certain volatile substances like benzine, ether and chloroform which do not succeed in killing the insect or the ova. When the insect feels danger it closes the opening of its tracheæ, thus rendering impossible the permeation into its respiratory apparatus of the dangerous substances, and the louse can comfortably wait for the complete volatilization of the dangerous substances.

The same is true of the various chemicals generally used, some of which have gained an undue and dangerous reputation, for the strongest of them, unless applied for a long and tedious length of time, do not penetrate its body, protected as it is with its chitinous involucrum, and the closed-down tracheæ. It is only in the light of these anatomical and physiological data that one can understand the entire failure of campaigns against this pest when conducted by the use of certain chemicals. Some such chemicals are skilfully mixed with greasy sub-

stances, and the reputation acquired by any particular preparation is to be attributed to the action of the greasy substances and *not* to that of the chemical; the oily substances indeed by closing permanently the opening of the tracheæ ultimately suffocate the insect. The louse has a visual apparatus consisting of compound eyes, but no simple eyes. It seeks the light when it is hungry, and it is then that it is most active in its movements from place to place; after feeding, it avoids light.

It is probably provided with an olfactory apparatus, though not yet demonstrated; it proceeds instantly in the proper direction when so placed as to choose where the human body is. At 4-cm. distance it easily finds its bearings toward the human body, even if another attraction be made in proper condition of temperature and humidity, so that perhaps it is not only the "heat sense" that guides it toward the prey. If placed at an even distance between two bodies, one of which is presented prepared in an ideal hygienic condition of cleanliness and one purposely chosen from among unwashed persons, it deliberately follows the direction of the person who is unwashed, disregarding the other. Though I could not assert this in a peremptory manner, I am fully convinced that it scents the peculiar odor of the woolen garments, for in many experiments, very cautiously conducted, I have infallibly noticed that it preferably follows the direction of the person who is covered or surrounded with woolen clothing, discriminating against the one clothed only in cotton, linen or silk. In reference to this last instance, however, I can assert beyond doubt that cotton, linen or silk does not deter it from selecting a victim, if none is clothed with woolen garments.

Like all insects it is provided with a circulatory system. What appears to me to be the most important anatomical character from the point of view of the clinician in general, and the bacteriologist in particular, is the anatomy of the pharynx, and particularly the distribution of the muscular fibers. It will suffice here to state that it is the disposition of the musculatory fibers of the pharynx which makes possible the sucking in of the blood while regurgitation of the stomach contents is prevented.

The further studying of the *P. vestimenti* has warranted two conclusions:

1. While it takes from 1 to 2 c.c. of blood to reproduce typhus by direct inoculation from man to man, 1 cubic millimeter of blood is more than sufficient to make the louse capable of transmitting the disease.

2. A louse which has bitten a man ill with typhus does not become capable of transmitting the disease before four or five days in the best of circumstances.

These two facts suggest, by analogy with what happens in the case of other diseases, that the rôle played by the louse is not only mechanical but that in his body the virus multiplies and increases in virulence, or that somehow it undergoes some evolutive phase, as happens to the malarial plasmodium. All this strengthens the opinion that perhaps the etiological agent of typhus is a protozoon rather than a bacterium.

Since 1910 Ricketts and Wilder had described in the epithelium of the stomach of infected lice, ovoidal bodies, whose polar ends were easily stained, and as they were constantly present they considered them the actual specific agent or at least a constant element of typhus. These findings were later confirmed by Prowaczek and others.

Rocha-Lima followed the study of these bodies and in honor of the two discoverers who had died of the disease he called them *Rickettsia Prowaczeki*. He found that they are extremely rare in lice considered non-infected, but that they appear in large numbers four or five days after they have bitten typhus patients. This lapse of time (four to five days) is coincident with the fact that only after such length of time do the lice become infectious. He found, furthermore, that lice which are made to bite typhus patients, if kept at an unfavorable temperature (20 to 25° C.) for four or five days and then made to bite animals or men, do not transmit the disease, and that in such cases the *Rickettsiæ* cannot be found in the epithelial cells of the stomach. We will point here that this is more or less what happens in the case of the anopheles in respect to the transmission of malaria. The *Rickettsiæ*, besides, do not appear in lice which bite convalescent patients, and we know also that the blood of convalescent patients is no longer infectious.

The *Rickettsiæ*, with the epithelia invaded by them, enter into the cavity of the stomach and from there to the intestines and later on with the stools to the outside. Sikora seems to have followed them into the salivary glands of the pediculus; if these latest discoveries become established facts they will solve a most important point. As the regurgitation from the stomach is made impossible by the anatomical construction of the pharynx, in case the disease were proven to be transmitted exclusively through the biting of the louse, it would mean that the virus would at least travel inside of the insect's body, to the salivary glands, perhaps much in the same fashion that malarial infection travels from the stomach to the salivary glands of the anopheles. And as the pediculus is not infectious for the first four or five days after biting an infected person, very likely the germ would, during this lapse of time, not only travel passively from one anatomical part of its host to the other, but it would, in order to do so, undergo certain phases of his cycle of life which are as yet unknown to us. If we recollect the fact that

while it takes from one to two c.c. of blood to reproduce the disease with direct inoculation, the louse can instead infect several persons four to five days after having bitten and sucked only 1 c.mm. of blood from an infected individual. Multiplication in the body of the louse is at least suggested. Still another fact of great importance for the prophylaxis is that eggs deposited by an infected female can in turn produce lice hereditarily infected with the *Rickettsiæ*, and consequently transmit the disease.

In conclusion we can make two assumptions: (1) that the *Rickettsiæ*, though we have not proven the assumption in an absolute way, represent either the specific agent of the disease or at least one of the stages of its life, and that they should be classified perhaps among the protozoa rather than among the bacteria, both for reasons mentioned above and for the fact that so far we have been unable to grow them in culture media; (2) that the means of transmission is the *P. restimenti* (it is very improbable that the *P. capitis* and the *p. Pubis* can transmit the disease, owing to their essential difference anatomically and physiologically from the *P. restimenti*).

There is still some uncertainty as to the unicity of transmission; in other words, is the virus inoculated by pediculus biting, or can it penetrate man's body in other ways? Certainly the *Rickettsiæ* are in the stools. There is surely at least one case of the disease having been transmitted by means of the feces of infected lice, that of Dr. Muller of Trieste, who in 1919, while studying that very question, contracted the disease in ways that do absolutely and most positively exclude any other way of transmission.

#### CLINICAL CHARACTERS

Very little indeed is to be added to the clinical descriptions given even in olden times, and these anyone can read in any of the textbooks. But a few points can be taken up here with advantage. The length of time of the period of incubation is not quite exactly determined, but we can say that it varies from a minimum of five to six days to a maximum of twenty days. We know how difficult it is to establish this period, because only rarely is it possible to determine in a peremptory way the exact moment at which the infection occurred. Oftentimes it has been even established that patients had no recollection whatever of having been bitten by lice. In one of those doubtful cases I was fortunate enough to be able to establish beyond a doubt the moment in which the patient had had the only opportunity of being bitten by lice, and in that case the period of latency was fifteen days.

The prodromic symptoms are more or less the same as we observe

in all contagious diseases; very frequently there is violent localized pain to the sacrum as in smallpox. Should we synthesize in a few words the clinical aspects of typhus, we could say that it is an infectious disease characterized by the sudden appearance of fever preceded by a chill, fever which in one or two days reaches its maximum and which lasts with but slight oscillatory changes for about two weeks. It is also characterized by the prevalence of symptoms of depression of the nervous system (stupor prostration) and of the heart, by the appearance at the fourth or fifth day of an exanthema most evident in its peculiar preference of localization to the upper part of the trunk, greatly resembling that of measles, in which the maculo-papules may later change into petechiæ, and further by the splenic tumor which is considerable in the first few days, and which diminishes later on, and by scarce bronchial and intestinal disturbances, with prevailing stipsis. The disease resolves between the twelfth and fourteenth days, with a fall of temperature by crisis which is peculiarly prolonged to about forty-eight hours and which is followed by a most rapid convalescence to the normal condition.

A peculiar symptom is that of the appearance of the eye, which is extraordinarily shiny and reddened. That, however, is not a symptom of typhus only, it being very frequent in recurrent fever, and consequently is to be taken into account only as a confirmatory symptom. And since the exanthema from which the disease derives one of the most common names is the capital symptom as the one that most quickly attracts the attention of the physician and more than any other helps him to suspect the diagnosis, it is well to remember that not seldom it is of very short duration, or it may be entirely missing, even in the most serious cases. It often remains in the stage of roseola, without turning into petechiæ, and that not seldom, even in grave cases, though generally there is direct proportion between the gravity of the case and the intensity of the exanthema. At any rate the denomination of exanthematic typhus must be considered more precise than that of "petechial typhus." A symptom to which there has always been attributed too much importance is that of the constipation which some authors consider as pathognomic. The constipation, when present, is generally very marked and very obstinate against action of the most energetic purgatives and enemas. While the importance of the fact of the presence of an obstinate constipation must not be belittled, still one must bear in mind that certain epidemics or at least the majority of cases in certain epidemics are characterized by a tendency to diarrhea. The importance of this fact, at least for prophylaxis, becomes greater when one thinks that generally the cases that herald the epidemics

mostly show diarrhea and could not be confused or mistaken for other diseases.

All classical cases show changes of the sensorium (like stupor and even coma) and myocardial changes, which may suddenly cause dilatation of the different sections of the heart and an extreme frequency of the pulse. Death occurs always by coma. As to complications, the broncho-pulmonary and the renal are foremost; neuritis often occurs—for instance, that of the acoustic which leads to deafness. Gangrene of the limbs, nose and genitals, is not infrequent. All these facts, together with the prevalence of petechial, explain the anatomo-pathological findings (which can be considered as characteristic) and which are alteration of precapillary arteries, both of the skin and of the inner organs, with tumefaction and excessive exfoliation of the vasa endothelium and consequent formation of thrombi in the artery and perivascular infiltration.

Characteristic is the rapid recovery. At about the twelfth or thirteenth day the patient, who appeared *in extremis* in a semicomatous state, with localized tendinous and muscular clonic convulsion, has in a few hours a sudden drop of temperature, falls asleep, has profuse perspiration, to wake up entirely changed. He has completely regained consciousness, the eye is clear, pulse valid, regular, and he begins insistently to call for food. Within forty-eight hours the temperature becomes normal, the urine abundant, and the patient enters rapidly into convalescence if there are no complications. The mortality varies, in different epidemics and in different localities, from 5 to 10 per cent to 50 per cent.

In children the disease generally assumes a benign course, and it is among them that we usually find the cases without exanthema or with a very slight and transitory one. This is the great danger, for these cases have an ambulatory development (children often do not even need to remain in bed). Thus children initiate and spread the epidemic in a latent form, so to speak.

As to the prognosis, it becomes more serious in direct proportion with the age of the patient. The nearer it is to summer the lighter are the cases; while, everything else being equal, the most serious cases and the most serious epidemics happen in winter. Cases contracted in hospitals such as those of nurses or doctors are generally of the most serious nature. One attack of the disease seems to confer a permanent immunity.

#### DIAGNOSTIC METHODS

The question of diagnosis of the first cases of an epidemic or of isolated cases is always an interesting question, as often one of the most grave in character because of the responsibility which it involves.

The differential diagnoses of exanthematous typhus from measles, German measles, smallpox, ileotyphus, meningococcus fever, and certain forms of influenza are all carefully mentioned in treatises; but one can positively assert that, as far as diagnostic ability goes, the having seen one single case of typhus goes much further than the reading of many books and publications. Thoinot had to conclude fully thirty years ago that, unless one's attention is drawn to the possibility of facing cases of typhus, one would never make the diagnosis from the symptoms of the disease alone. On the other hand, the diagnosis is very simple during an epidemic. Hence the necessity on the part of the sanitary authority not to conceal the appearance of the first case to at least all medical men. Any physician in whose mind there should exist the possibility of his facing a probable case of typhus must readily notify the proper authority. In the meantime he should obtain  $\frac{1}{2}$  c.c. of blood and send it to the nearest bacteriological laboratory for the sero-diagnosis, since fortunately the advantage of such a diagnostic means as the Weil-Felix test, according to the consensus of opinion of almost all observers, must be considered constantly reliable.

We made reference, when discussing the etiology, to the importance attributed to several protei and among them particularly to the one isolated from the urine and from the blood of typhus patients and classified as *Proteus* X-19. Contrary to general rule about all protei, this *Proteus* X-19 is very difficult to isolate. If we add that, as far as can be ascertained, the *Proteus* X-19 is absolutely innocuous to those very animals who contract typhus by the injection of infected blood, we may easily understand how this microorganism is not generally believed to be the specific agent of typhus. This in spite of the contrary opinion of Freidberger, inasmuch as admitting that we could not explain the mechanism of admission through the louse, whose action as an agent of transmission is now absolutely certain and beyond doubt.

Nevertheless, as Weil and Felix discovered in 1917, the blood of typhus patients at the fourth or fifth day of the disease, and sometimes later, acquires the property of agglutinating the *Proteus* X-19, and this agglutinating power increases with the progression of the disease. During convalescence this ability to agglutinate seems to diminish, though it remains, to a fair degree, present for a long time, and according to Lustig it can be obtained even two years after recovery. There is another variety of proteus, the X-2, likewise isolated from typhus patients, which can be agglutinated, but with this variety the reaction is not constant.

The Weil-Felix agglutination can be considered inclusive for typhus only when it is obtained at a dilution of at least 1/50 because at below



1/50 other febrile diseases, and even some healthy persons, may give a positive reaction. We know that normal sera may have a slight agglutinative power for various microorganisms. Indeed, owing to this fact, several observers did not want to attribute any value to the Weil-Felix test; now, however, we can consider as proven beyond a doubt that an agglutination at 1/100 of a fresh culture of *Proteus* X-19 is conclusive for exanthematic typhus. In two cases only may there be the possibility of error: first, in some sick person who just recently recovered from typhus; the second instance may grow out of the case of a patient in the first days of the disease in which the differential diagnosis swings between ileotyphus and dermatyphus, and whose blood gives positive Widal reaction at 1/100 dilution, and yet even here there is a 1/150 agglutination of *Proteus* X-19. In such a case all doubts may be cleared up if the patient's history shows he has been subjected to the typhoid fever vaccination. Such cases as this may be very frequent. Dr. Lustig in a very valuable publication demonstrates how easily the error can be avoided; for by repeating the two tests in two or three days one can notice that, while the titer of dilution for the Widal test remains the same, the titer of dilution for the Weil-Felix test increases progressively to 1/300 and often to 1/400 at the seventh day. In cases of typhus the titer of dilution may arrive to 1/600 and even to 1/1000 or 1/2000. In rare and as yet unexplained cases it retards to the thirteenth or fourteenth day—that is, to the end of the disease—although it always appears. Any well-organized laboratory is provided with the culture of *Proteus* X-19 and can issue the verdict on a doubtful case in a few hours.

For historical reasons, and to the honor of Nicolle and Conseil, we must here mention a diagnostic method suggested by them several years ago, before the discovery of the sero diagnosis of Weil-Felix. It is based on a perfectly sound principle and is of comparatively easy technique. It consists of the injection of a few cubic centimeters of the blood in question into the peritoneum of a guinea-pig. The animal shows no local reaction, but it gives a rise of temperature which lasts about two weeks.

The advantages of the simpler and less expensive technique of the Weil-Felix reaction are so obvious that we do not consider it necessary to discuss them. But the method is a very good one in case one is not provided with a *Proteus* X-19 culture, a thing hardly to be expected, since everyone who is provided with all the implements for this test would more than likely be equipped with all the simpler ones necessary for the Weil-Felix reaction.

As it can no longer be admitted or even discussed that the *Proteus*

X-19 be the specific agent of typhus, nor a constant germ of secondary infection, for the reasons exposed above, the Weil-Felix reaction remains positively as a strange phenomenon, and only hypothetical explanations can be advanced. The following seem to us more sensible: either it is a mere coincidence—that is, we are facing one of those phenomena of eterogenetic formation of anticorpi such as we have other examples of in the instance of the rabbit serum which treated with renal cells of guinea pig becomes hemolytic to the red cells of the ram—or it is merely a fact of paragglutination. That is to say, the *Proteus* X-19 has come to acquire the property of being agglutinated by a serum which has become immune under the action of another germ (filtrable virus) which germ lives with it in symbiosis and comes to affect the receiving apparatus. A proof in favor to the hypothesis is given to us by the fact that by treating an animal with *Proteus* X-19 only one obtains a serum likewise capable of agglutinating the proteus, while, on studying comparatively the agglutininus of this serum and of those of the serum of a dermatyphus patient, one finds a distinct difference between them. Or may it not be possible that the capacity of the proteus of being agglutinated by a typhus positive serum may be nothing after all but an hereditary character of this germ, hinting at a common origin of all germs previous to their differentiation that has occurred under the influence of causes as yet unknown to us, but perhaps similar to those that have affected the differentiation of many other living organisms?

#### TREATMENT

As we have no specific means of medications as yet, we will have to be limited to symptomatic treatment and cure. We may here mention the utter failure of the use of quinine as a specific. Cardiac stimulants must be used, giving the preference to strychnine and caffeine. Constipation must be controlled within the first few days. Contrary to general belief and practice, the use of antipyretics is a bad one; instead, cold pack and cold baths are indicated. General cleanliness of the skin to a certain extent and of the mucous membranes in particular is the very best of practices in order to diminish the probability of the formation of abscesses, bed sores and gangrenes. Feeding should be attended to most scrupulously and should be most substantial, particularly during convalescence.

#### PROPHYLAXIS

The very best means of prophylaxis would be a vaccine like that of smallpox, capable of conferring a permanent specific immunity, but unfortunately until now all efforts toward vaccination have failed. We can obtain an immunity of short duration (a few days) by injecting

the serum of patients carefully liberated of leucocytes, or the serum of a horse treated with the extract of the spleen, brain suprarenal capsules of infected guinea-pigs. Here we must point out that the difficulty of conferring permanent artificial active immunity seems to depend upon the fact that such immunity as the one acquired after an attack of typhus is not due to the formation of antibodies, and to their being poured into the organic liquids, but instead it seems to be a real and actual modification which takes place in the tissues. It would be, in other words, an histogenic immunity.

As we cannot now immunize the body directly, we must resort to the preventive means, that is to say, to the fight against the carrier of the disease, the *P. restimentii*. The first duty is not to let the epidemic reach us before we have ready the means with which to meet it effectively, for we must not forget that once the epidemic has taken hold, we have only the half means of combating it, and generally we must simply stand helplessly by, watching its developments.

The delousing methods adopted by the American Army for the large bodies of troops are of the very best type, and we refer the reader to the description given in the proper publications.

Each hospital in any typhus-threatened area should be provided with a small, well-equipped section adjacent to the admission ward, where each patient and his belongings should at the moment of admission undergo a most scrupulous delousing process. If possible, the attendants to this entire section should be selected from among those who have acquired an immunity through an attack of the disease. At any rate all persons working in it and handling patients' belongings should be dressed in clean, one-piece suits covering them from head to foot, buttoned on a double-breasted plan in the back. The face should be heavily smeared with grease, lanolin vaseline, or plain olive oil can be used. Hip-high rubber boots and rubber gloves closing tightly about the wrist should complete the outfit. The physician should be protected likewise, though during an epidemic he need not even go near patients, since their appearance and that of the exanthema command the diagnosis. In handling the patient, care should be taken not to allow rapid movements during the process of undressing; clothing should be unfolded and rolled rather than pulled off.

Whenever there is even the mere possibility of facing the disease, the prompt shaving of all hairy parts of the body should be resorted to, taking great care to avoid scattering hair on the floor or on the bed; the bed in fact should be protected with a large water-proof sheet or heavy muslin soaked in creoline; kerosene oil can be advantageously substituted. Such sheets, after the operation of undressing is over,

will be promptly folded up and sent to the sterilizer. It is advisable and very practicable to use depilatory pastes rather than razors, for obvious reasons of saving time, material, danger, and personnel. Dr. Pepen, who had years of experience on the eastern front, found that a paste made by mixing water with two parts of sulphate of strontium, one part of sulphate of zinc and one part of talcum, can be spread with a spatula on the parts in question, and in one quarter of an hour can be removed together with the hair. The only precaution to be taken is that of guarding the eyes from the mixture and the powder. After the depilatory process, the patient should be carefully bathed under a shower. If a bath tub is used, care must be taken to change the water at least once. Should a careful inspection prove then that the patient has been completely liberated both of lice and their eggs, then he can safely be treated even in common wards among other patients, provided that one can make it impossible for other lice to reach his body and to transmit the disease. The disinfection of the place of delousing can be well accomplished by the burning of sulphur and alcohol in proportion of 9 pounds of sulphur for each 100 cubic meters of air capacity. The room must be air-tight and not opened for from eight to ten hours. Barracks and other places that cannot be rendered air-tight will have to be flushed and scrubbed with a high percentage solution of creoline or creosol. Old clothing, rags, etc., will be burned. The using of steam at high pressure is the only safe means of disinfecting the clothing and linen.

It is generally held that a building where there have been typhus patients can be considered safe, if kept closed for one month; for in this lapse of time all lice have died of starvation and the virus which may have been deposited with the stools by the lice has lost its virulence. But one must not lose sight of the fact that dirty linen or clothing or other organic matter may have remained and served as food for the parasites. Consequently it is a safe precaution to keep the building closed for two months.

As to the using of ointments as preservatives, we have already explained their mechanisms of action. Dr. Muller does not advise the use of mercurial ointments, owing to the fact that they must be used extensively all over the body and that they may cause serious inconvenience to the general health. He advocates the use of ointments based on orthocresol instead, and of antiparasitary clothing made so by orthocresol and crude naphthaline.

Patients shall be kept isolated for twenty-one days after the fall of the fever; likewise all suspicious cases, and all persons who have become quarantinable, must be kept away from those in no way exposed to the infection.

## SPONTANEOUS GANGRENE OF THE SCROTUM<sup>1</sup>

By JOHN A. HAWKINS, M. D.

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GANGRENE of scrotum, not due to extravazation of urine, is rather rare, and the following have been assigned as causes: "Erysipelas, thrombosis, embolism, influenza, with reference to typhus, syphilis, gonorrhea, diabetes, prostatic disease, pediculosis pubis, ergotism, traumatism and frost bite" (Allen, 1894). Chemical causes have also been assigned.

Güiteras mentions that he has seen but one case. There is no question of its entity, having been first described by Pournier in *Semaine Medicale*, 1883-1884; In 1905 Whiting collected 93 cases with a mortality of 22.2 per cent; and Coenan and Przedborski in 1911 collected 145 cases with 22.1 per cent mortality. In searching the records of the Philadelphia General Hospital covering 1904 to 1920, Randall found reports of 147 cases of gangrene of the scrotum from all causes, from which he isolated and reported to the American Urological Association 16 cases answering to the description of the disease under consideration, with 5 deaths, or more than 31 per cent. Marchildon, *The Urologic and Cutaneous Review*, June, 1921, reports an interesting case with illustration. Most textbooks have given it but scant or no consideration, this being particularly true of the more recent works, although Fuller goes into details in describing it in "An American Text-Book of Genito-Urinary Diseases, Syphilis and Diseases of the Skin" by Bangs and Hardaway (Saunders, Publisher, 1898), and I will quote him quite fully:

There is, however, a form of gangrene in this connection which occurs occasionally and which exhibits marked characteristics. This form is called "spontaneous gangrene." It appears suddenly and with little or no warning. The scrotum quickly swells, often to a great size. At first it is red. This color, however, rapidly becomes dusky, and soon the parts markedly involved become dark gray or black. After a day or so the line of demarcation forms, and then gradually the lifeless tissues slough off, leaving one or both testicles, according to the extent of the slough, exposed. Sometimes this destructive process is so extensive as to involve the penis as well as the scrotum. The exact cause of this form is not known, though it is probably of bacterial origin. . . . Some of these cases are complicated by emphysema. Surgical treatment should always be most conservative. . . . Necrosed masses should be removed as fast as they become detached.

He further warns against cutting away the gangrenous parts as healthy tissue might be removed and absorption favored. He then

<sup>1</sup>From the Genitourinary Department, South Side Hospital, Pittsburgh, Pa.

advises that the flaps be allowed to granulate in order that they may cover in the denuded testicles, and calls attention to repair in these words: "It is wonderful to what extent Nature, if left to herself, will accomplish repair in these cases." He further quotes C. W. Allen, of New York, as publishing an interesting article on this subject. This was written by Fuller, twenty-three years ago.

Bevan, writing in *Keen's Surgery* (1911), says:

Erysipelas of the scrotum is distinguished by a tendency to gangrene in severe cases. Sometimes the entire scrotum is lost and the testicles are left uncovered. It is remarkable, however, how complete a new scrotum may be formed. The granulation tissue covering the testicles contracts and gradually draws the remnants of the scrotal tissue over these organs. A plastic operation may, however, be required in order to cover the testicles with skin.

I have quoted these authorities in order that we may realize that spontaneous gangrene of the scrotum is not a newly discovered disease, but that evidently its occurrence has been lost sight of by many writers of the present day in their quest for evanescent ultra-scientific will-o-the-wisps at the expense of permanent facts discovered by our predecessors using their brains and five senses.

J. D. B., aged 40, a shipping clerk, married and the father of six children, with no history or suspicion of venereal disease at any time, took sick while at work, September 9, 1921, with headache and malaise, but without chills.

For three months previous to the present illness the patient had been feeling unusually tired, with marked loss of appetite and had lost 15 pounds off his usual weight of 175 pounds. All this without any apparent cause.

He quit work an hour early and went home and ate a very light supper. Feeling badly the following day he remained at home. The next morning when he arose to urinate he noticed his penis was much swollen, and later in the day he discovered that his scrotum was so swollen as to interfere with locomotion. There was not the slightest pain at any time either in the penis or scrotum. Although the quantity of urine was scanty, he had no difficulty in voiding. I first saw him during the evening of September 13. At that time he had a temperature of 104° F. with rapid pulse and looked a very sick man. His penis was swollen to the limit, as was also the scrotum. The under surface of the penis and the scrotum to within a half-inch of its margin was a dirty grayish color, mottled with purple and black spots. There was no pain, only a sense of weight. At that time the odor of gangrene was unmistakable, and I warned the family as to the local result and the possible danger to life. The patient's bowels were not constipated

at any time. There was evidence of fluid in the tissues, but no crackling to indicate the presence of gas. Next day, September 14, the skin was breaking down and leaking a sanious fluid, and the odor was intense. The progress of the gangrene had halted and by September 15 an irregular area  $1\frac{1}{2}$  inches wide involving the prepuce and under surface of the shaft of the penis was separating, leaving the corpus spongiosum standing out in bold relief. The scrotal tissues were also giving way in a mass. Four days later, September 19, the scrotum was found in the dressings, all the structures down to the tunica vaginalis testes having separated.

The statements made by some writers, that with the separation of the slough the toxic symptoms disappear, was not true in this case, for the second and third weeks of the disease were the most critical.

In the third week of the disease an abscess appeared in the right groin, followed a few days later by one in the left loin. These were incised and drained. A third appeared immediately over the left Poupart's ligament and spontaneously evacuated itself at the edge of the denuded area. All these abscesses were located between the muscle plane and the skin and resolved promptly.

When I first saw this patient I was informed that he had been seen by another physician and a diagnosis of erysipelas was made, and to avoid embarrassment I reported the case as such, as I was at the time unable to disagree with the former diagnosis. Although there were no chills at any time in the course of the disease, the symptoms were much like those of the old-time phlegmonous erysipelas. Cultures from the surfaces of the affected parts showed streptococci and staphylococci. Cultures from the abscesses showed "hay bacilli." No diphtheroid bacilli from either location.

The treatment of this disease, as outlined by previous writers, differs quite considerably in certain respects. For instance, some recommend early incision, while others intimate that to cut into possibly healthy tissue encourages absorption of toxins. Hot applications are generally advised, Randall recommending potassium permanganate solution, the suggestion being due, probably, to the intense odor.

In this case a solution of magnesium sulphate was first used, being shortly succeeded by an experimental bromine solution. This was followed by boric acid solution. The parts were protected by gutta-percha tissue, the moist dressings being applied over the perforated tissue and the parts supported by a "pillow." Were I to see another case I might use any mild lotion to favor separation, as one is as good as another. Bromine and chlorine solutions surely assist as deodorants. Cutting into the tissues, even though gangrenous, will do no good, and

underlying healthy structures might be scarified and thus favor further absorption.

General treatment to overcome the toxemia and to support the failing strength of the patient is urgently indicated.

Comments on this particular case: Usually this disease strikes down a man who is in the best of health. This patient had been working every day, but for three months he had not been feeling well. When he went to bed he weighed about 160 pounds. When convalescence began he weighed apparently about 130. At the present time, December 30, 1921, he weighs 185 or 10 pounds more than he ever weighed. His wound is completely closed today, three months, all but nine days, from the day he went home sick. Regarding the possibility of drawing the edges together with sutures, it was an absolute impossibility as there was nothing left but edges. The toxemia was more marked in the third and fourth than in the first or second week. The abscesses appeared after all sloughs had separated. There was no pain at any time. There is very little scarring of the scrotum, and although the shaft of the penis is pulled slightly downward by the cicatrix, it has not prevented copulation.

My opinion is that this disease is erysipelas.

This is the second case of the kind that I have seen. In the first I was called in consultation as the question of castration had arisen. Under no circumstance is castration indicated in gangrene of the scrotum from any cause.





## MILITARY USE OF INTELLIGENCE TESTS

By R. SHEEHAN

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INTELLIGENCE tests have been utilized for years in psychological laboratories, but it is only of late that they have been applied to the practical problems of pedagogy and psychiatry. Their value in these fields made it apparent that they might be advantageously used in the military services as a means of excluding mental defectives. Considerable work has been done in the endeavor to adapt them to this purpose. Unfortunately, in the beginning, like most new measures, they have been accorded by enthusiasts too much import. Now, after the flame of novelty has gone out, they have subsided into true worth.

Due to the fact that these tests were acclaimed by the popular press and even by some technical writers, as an exact means of estimating the mental and even moral mechanism of any normal or abnormal person, they were widely utilized often by persons having little or no real scientific knowledge; therefore their true value has been obscured by uncritical exploitation and mystification.

The test which has received the most attention is the so-called "Binet-Simon scale." This was evolved as a means of measuring the development of the mind—that is, to estimate the degree of retardation. The method is an application of the idea that mental development shows distinct accretions from year to year. This first appeared in 1905 and, after experimentation and revision, the present scale was published in 1911. In its use, if a child shows a psychological age of 12 years or more he is presumably normal. The tests estimate the capacity of the mind for acquiring simple knowledge at various degrees of maturity.

It must be realized that for our purposes all of these tests have their limitations and imperfections. Different examiners will show great variance in their results. They cannot be considered an instrument of precision and probably will never become exact. There are always present many delicate possibilities of variation. These may be due to the varying conditions of the examiner, the subject, or the method used.

Skilled examiners show great differences in the results obtained, so that with those untrained the tests are almost valueless. The observer should be trained in psychology. He should be familiar with the technique and intent of the tests before attempting to apply them, and preferably should have attended a psychological laboratory where

they are in constant use. He should self-consciously prepare to avoid all possible interference with the accurate determination of facts. His qualities and attitude are most important. The examiner should be aware of his own personality, and success or failure will depend upon his ability or inability to get in accord with the individual examined. It is palpable that the determination by tests of the possible existence of abnormal mental states can only be made by those with a highly technical training and large experience.

It must be appreciated that these tests are only indicative and can only be of value where the results obtained are estimated in consideration with all other factors, as they alone are inadequate to completely estimate the individual. The tests may not reveal what might be important to know, and they merely point to special abilities or disabilities which may need other investigation. These stereotyped methods are useful mainly as an exploratory procedure. As originally devised they were never intended to measure general ability apart from schooling. In their application and in the interpretation of results, much shrewd common sense must be used. They should not be undertaken until the subject understands perfectly what is required of him. If the tests are used in conjunction with other determining evidence, they are valuable and well worth attempting to utilize for our purposes.

The high-grade defectives, who really are the only ones who seriously come to our attention, certainly need additional, if not other methods. There is no doubt that the best criterion of the adaptability of a candidate would be a longitudinal section of his career. However, when he presents himself he is governed by a desire to enter the service and naturally it is not to be expected that much information will be obtained from him gratuitously which will assist in his exclusion. In other words, he is on the defensive, putting his better side foremost, and the burden of proof is with us. Here, then, is where the necessity arises for some measure which will appraise him, independently of his volition. It has been in the hope of filling this void that these intelligence tests have been so readily grasped.

In criticism of them it has been said that they are dependent upon book knowledge and not upon inherent power of mind. They rely in great measure upon education. Having been properly standardized for children under 12 years of age, they are of decided and certain value with them, especially in gradating educational methods. However, not having been so standardized for adults, they are not suitable for use with them except as part of an examination. They are but one of the means of formulating an opinion just as the leukocyte count assists in the diagnosis of pneumonia.

It is the consensus of opinion among competent psychologists that these tests are of great value within well-defined limits, but those above 12 years should not be so considered, as they are too uncertain. For these upper ages they have been found quite unfair. And this is true even for the revisions especially devised for this class. Before we can approach accuracy in their use it will be necessary to establish a norm. This should be obtained by examination of those willing to cooperate; that is, of those who have done their best, and the result of the best possible efforts of the candidate should be compared with this standard. And unless this is done the result is of little use in predicting the future of the individual.

It is well to recall that there are many persons who are mentally defective in their emotional life but who do not show any intelligence defect. In such cases, even in childhood, these tests do not reveal the deficiency. It is believed that many of this type are trouble makers in the service. Our endeavor should be to elaborate the tests so as to exclude such individuals. We can only hope for results in this way by using tests which are not utilized as a measure of intelligence alone, but rather as a means of learning the content of the mind; that is, whether a subject has a tendency to take things with a peculiar personal reference or exaggerated self-consciousness, and to diagnose disturbing trends of thought. The facts as elicited by tests cannot be evaluated without considering the personality, nor are the essential facts of mental life to be observed with indifference, neither can they be estimated like an experiment in physics. The analysis of the emotional life is probably the most important part in the study of the personality, for not only are the emotions the foundation of all practical life but they are variable components of the abstract intellectual functions.

These tests have received a great deal of adverse criticism, most of which has been deserved and occasioned by the effort of some of their advocates to displace the social definition of feeble-mindedness by the totally artificial one made by these tests. It is not believable that this can ever be accomplished. The mere inability of an individual to pass a certain set of tests will never be regarded as an absolute proof of feeble-mindedness. It must be realized that the relation of ignorance to feeble-mindedness is a difficult one to decide, and the indications are that the relation, if any exists, is a slight one, and a test intended to reveal the amount of knowledge a certain individual possesses is of very little value unless he has had a formal education. The emotional value of the facts in question must be weighed. Probably with continued experiment and consideration of the other factors, aside from the purely intellectual, a satisfactory set of tests may be evolved which will repre-

sent what the average desirable recruit should be able to show if he is to be considered normal. However, enormous variations occur within the limits of normality, and an inelastic method is far from desirable. These methods based on statistical theories are valuable in modern science, but their application to this human problem is liable to many serious errors. Everything is not known concerning feeble-mindedness, and much in the current literature is largely predicted on assumptions, some of which are erroneous, while others are very dubious.

Among military prisoners, our frank undesirables, it has been noted that the moron is not found frequently less than ten in 100 examinations. Epileptics are probably more numerous. Chronic alcoholism accounts for a large number of delinquencies and this, of course, existed prior to enlistment. Habitual drunkenness in psychopathic individuals is responsible for another large group of offenders, as many as several other factors combined. Then there are the so-called "moral imbeciles" or "defective delinquents." They seem to be normal as far as intelligence is concerned, and appear to have ample ability and shrewdness and even cunning, but they lack moral sense, moral judgment, moral stamina, and the ability to adapt themselves to their environment. It would appear that the large majority of the mentally unfit in the service would have at the time of their enlistment survived the intelligence test. They are mostly (over 56 per cent) embraced in the groups termed dementia precox and, as is well known, these patients oftentimes are in childhood especially bright in school and readily acquire the knowledge demanded by these tests. Careful examination of numerous patients admitted has detected very few that were feeble-minded, and in hardly any of these was this the likely cause of the episode which led to admission. In the use of these tests without considerable latitude it is still questionable whether some potentially good men might not be excluded. It has been found that some of the higher scale questions were too difficult for high-school pupils. In a first year high-school class only one boy accomplished all the tests. Even highly trained normal individuals have failed in them. It would seem that the tests are still so special in their application that it would not be safe to say that one who does not pass them did not have a mentality of at least 18 years. They have not been perfected so that they will bring out the defects of persons above 12 years of age and thus show how much responsibility the individual can bear and what can be expected of him. They are still too much a test of formal education to be useful in our work as a routine measure.

There is no question as to the desirability of excluding the moron from the service, but are we justified in taking, say, 25 minutes of the

recruiting medical officer's time, of which it seems to be agreed he has none too much, to use a measure which, so far at least, only detects those which are really a small part of our undesirables? May we not be going to the extreme, and by paying so much attention to this phase of the examination be compelled to limit the remainder and thus pass over equally important physical considerations? Could not this mental examination be better accomplished by having a period of probation at the training stations, during which the men would be kept under continuous observation, and not only be subjected to the mental test which is finally agreed upon as the proper one for our use, but further be submitted to the test of showing their reactions to the environment? Here there would also be the advantage of having these observations made by medical officers who through doing this duty could become skilled in the work, thus assuring accurate results, and also obviating the possibility of depriving the service of potentially good men.

In utilizing these tests to assure good results, the surroundings and examiner must elicit, on the part of the subject, attention, interest, freshness and understanding, and secure him free from distractions and fatigue. Surely these are not the conditions obtainable in the average recruiting office. Further, more than one sitting is usually necessary, except for testing the clearly feeble-minded. Another serious objection to the test is the time limit which makes the whole procedure stereotyped, rigid and mathematical, which serves to reduce the whole method to an absurdity. Wide time limits must be allowed before discrimination for or against the performer. As a basis of all tests, a study of the intellectual equipment is indicated, and this, when fully carried out, involves a large amount of time and means an almost entirely specialized piece of work. In their final evaluation the varying qualities of the individual must be considered, such as comprehension, response to stimulation, attitude, willingness and sullenness, all of which observations require more time and opportunity than is allowed at recruiting offices.

Another point not to be forgotten is the difficulty in devising tests suitable for our purpose, when we have to apply to what is really a cosmopolitan group a measure originally designed for use with a homogeneous people. So far it has not been found that any set of mental tests exists at all adequate to indicate the capabilities, and these are what we wish to estimate. Various modifications have been suggested, and perhaps with standardization they might prove useful as a routine measure at the training station. They should be applied to at least 500 sailors and marines who by their actual acts have proven not only that they are intellectually capable but that they have sufficient emo-

tional stability to adjust themselves to all conditions of service life. For our purpose these would constitute normal men. Then compare the results with a similar examination of those who have shown that they are incapable of doing their duty or adapting themselves to these conditions. It is only by such an experimental work that we can hope to obtain an effectual and practical set of tests.

It is well known that very few people who are mentally defective are ever able to learn to read and write. So that, while the service is not pressed for recruits, a literacy test, aside from any formal tests, should enable us to exclude, with a fair margin of safety, those whom such a test would detect. This connotes that the illiterate are undesirable and should be excluded.

Any test which seems adaptable to recruiting stations should be supplemented by a study of the mental condition of recruits, carried on for several months at the training stations by medical officers experienced in this particular field.

It might be of value to consider requiring a candidate for enlistment to bring with him some evidence which would enable the recruiting officer to more advantageously judge his history. This would approximate what some foreign services obtain through their perfected statistics and records.



## LABORATORY SURVEY OF MEN ATTENDING THE C. M. T. C. AT CAMP JACKSON<sup>1</sup>

By WESLEY C. COX, A. B., M. D.

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BECAUSE of the general discussion among the medical profession, public health officials and the public in general concerning the health of the inhabitants of the southern states, the men attending the Camp Jackson Citizens' Military Training Camp formed a most interesting group for laboratory investigation in regard to two infections common to this territory, namely, malaria and hookworm.

These young men, varying from fourteen to thirty years of age, representing the best type of citizen and coming from both urban and rural districts, gave a cross-section of what might be expected from these states as a whole. The numerical allotment of men to the camp was made on the basis of the population of the individual states, so that the final figures give accurate information for comparison.

The examinations for malaria and hookworm were conducted by the Laboratory Section of the 5th Division and were carried on while the men were being given their final physical examination for admission to the camp. As the candidates filed past they were questioned by the laboratory officer as to their previous history in regard to malaria, chills and fever, chills, ague, typhoid and malaria, etc. Details were elicited both by name and symptom so that each positive history was completely checked up.

Following this questioning two blood slides were made on each man, regardless of previous negative history. These were numbered and stained for subsequent examination. A specimen of feces was obtained from each man and sent to the laboratory.

In all, 1,056 men were questioned and examined. The stained malaria slides were examined the week following their taking. These were carefully gone over by the laboratory officer and two enlisted technicians, who were skilled in the identification of the malaria plasmodia. Each worker examined a slide, noted his result, and passed it on to the second and third workers without comment. In this way each slide was examined three times; there being two slides on each man, a total of six examinations was made. When the results were compared there were no positive slides found, although 190 men, or 17.9 per cent, gave a definite positive history of having had malaria

<sup>1</sup>From the Laboratory Section, 5th Division.

prior to 1921. There were no histories of malaria, either new or relapse, in 1921.

During the duration of the camp there were three men admitted to the hospital with all the cardinal symptoms of a malarial paroxysm. These men were found positive for benign tertian by the laboratory. Two cases admitted for "Reaction Following Typhoid Inoculation" were found to be positive for benign tertian malaria also, in the routine examination which was made at this camp on all hospital admissions. Of these five positives all were from the group of 190 giving a positive history. Three had had malaria in 1920, one in 1919, and one gave a history of recurrent attacks over several years, the last in 1920. Because of the fact that practically every man was inoculated with triple typhoid vaccine and vaccinated against smallpox upon entrance into camp, there is the possibility that this may have the effect of stimulating latent plasmodia in the deep circulation sufficiently to cause a malarial paroxysm in the above five men. The number of cases is too small for any definite conclusions to be made, but further observations should be made along this line.

The percentage of men giving positive histories by states is shown in Table 1:

TABLE 1

States	Number of candidates	Number giving positive malaria history	Per cent giving positive malaria history
North Carolina.....	148	19	12.8
South Carolina.....	115	12	10.4
Georgia.....	229	38	16.5
Alabama.....	135	27	20.0
Florida.....	69	36	52.1
Mississippi.....	80	15	18.7
Louisiana.....	100	24	24.0
Tennessee.....	180	19	10.5
Total.....	1,056	190	17.9

The malarial rate for the Citizens' Military Training Camp was 56.81, while that for Camp Jackson as a whole for the corresponding period was 38.94.

The results obtained from the examination of the feces are most interesting. There being time to obtain but one specimen from each man, this specimen was prepared according to the Barber technique, and each of the three laboratory workers examined a portion of the final preparation and the results were compared.



A total of 512 positives were found, or 49.4 per cent. It is thought that, if there had been sufficient time to re-examine those found negative, the number of positives might be slightly increased. The percentage of positives by states is shown in Table 2:

TABLE 2

States	Number of candidates	Number positive for hookworm	Per cent positive
North Carolina	148	60	40.1
South Carolina	115	59	51.3
Georgia	229	118	51.6
Alabama	135	69	51.1
Florida	69	48	68.1
Mississippi	80	39	48.7
Louisiana	100	41	41.0
Tennessee	180	78	43.3
Total	1,056	512	49.4

It is interesting to note that 78, or 7.5 per cent, of the entire camp gave a positive malarial history and were also positive for hookworm. Of the 190 giving a positive malarial history 43.1 per cent were positive for hookworm.

Owing to the limited duration of the camp and the strenuous program, only those found positive for malaria received treatment. Those positive for hookworm were furnished with a report as to the condition found and an outline of the necessary treatment.

There being no treatments given, no information was obtained as to the number of worms carried by the infected individuals. From the great numbers of ova seen in the majority of specimens it may be assumed that most of the positives were heavily infested.

Personal interviews with many of those found positive brought out the fact that they had taken one or two treatments but at no time had completed a course of treatment checked up by laboratory examinations and had never completely freed themselves of worms.

While the Citizens' Military Training Camp was in session, Company "A," Louisiana National Guard, arrived at Camp Jackson and went into camp for two weeks' training. These men were all from the city of New Orleans and were city dwellers.

This company was surveyed for hookworm and malaria in the same manner as the Citizens' Military Training Camp. In the laboratory the same technique was used. Of the 97 men, none were found positive for malaria, although twelve gave positive histories. The

histories varied from attacks in early youth with no recurrences to one history of recurrent attacks, the last two years ago.

The hookworm survey showed forty-seven men positive, or 48.4 per cent.

TABLE 3

*Malaria*

Number of men examined	Number giving positive history	Per cent
37	12	12.2
<i>Hookworm</i>		
97	47	48.4

## CONCLUSIONS

The figures gathered from these surveys are representative of conditions to be found in this section of the country. They indicate that men entering the service from these states should have careful laboratory examinations for hookworm made while at recruit centers.

The length of time needed for the proper examination of men to determine malaria carriers is so great that it is doubtful if a survey of all men should be made where the men are to be in camp for such a short period, i. e., twenty-eight days.

All men should be carefully questioned, however, and those giving histories of recent attacks of malaria should be kept under observation. Anti-mosquito campaigns are necessary, for with the elimination of the mosquito the carrier ceases to be a danger to the camp. Mosquito bars should be issued as part of the equipment and the men instructed in the proper use of the same.



## BASAL METABOLISM AND THE BASAL METABOLIC RATE IN DISEASE<sup>1</sup>

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THE following discussion of basal metabolism and its clinical applications has been written primarily for the members of the medical departments of the military services; and it is intended to give a more or less general picture of the subject, with the idea of answering for both the clinical and laboratory staffs the questions as to what basal metabolism is and as to its practical value and application. The subject has become of very great importance to practically all branches of medicine, touching directly, as it does, internal medicine, neuro-psychiatry, surgery, and endocrinology especially; and, with the clinical staff calling for the procedure, it behooves the laboratory section of any medical organization to so equip itself as to be able to meet this call. No attempt will be made to present the details of the actual determination of basal metabolism, nor to do more, with regard to the various methods therefor, than to indicate the principles on which these methods depend. Rather will the effort be to give both the clinician and the laboratory worker sufficient knowledge of the subject that they may understand the limitations of the procedure and not fail in their interpretations of its results, either by attempting to apply it where it can be of no aid or in relying too implicitly on it, without giving due regard to the clinical and other laboratory findings in any given case.

Basal metabolism, as this term is used among physiologists, is the metabolism of an organism in the "fasting-resting" state; i.e., it is the metabolism going on in a body which is performing absolutely no work beyond that just necessary for it to maintain itself as a living organism. And the basal metabolic rate (commonly abbreviated B. M. R.), is the measure of this metabolism of the fasting-resting state in terms of calories per hour referred to some physical characteristic, such as body surface, or weight. In order to facilitate comparison, the rate is usually expressed as a percentage of variation either above or below the predicted normal for the individual in question. This so-called "normal," which, perhaps, would better and more correctly be termed an "average," varies with sex and age; but it has been fairly definitely determined for the two sexes at different ages, and we have, therefore, a standard to which we may, not unreasonably, expect a given subject to conform more or less closely. This matter of the normal and allowable

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variations therefrom belongs, however, rather to the field of clinical interpretation, and they will be considered in more detail later.

Basal metabolism has been a subject of interest and study for years, but it is only recently that the application of its findings to clinical work has been made possible. Before this time its study was more or less dependent on the large chamber calorimeters, in which the entire body could be inclosed and by means of which the complete energy of the body under observation, as represented in its total heat production, was determined. This method of *direct* calorimetry was, of course, impossible of application to any great number of patients at large.

The extreme delicacy and great expense of the apparatus involved—the length of time, and the number of specially trained assistants, necessary for its successful operation—all served to limit its usefulness. It was long apparent that there was needed some simple and practical method of *indirect* calorimetry, by means of which, instead of measuring the actual heat production as is done in the chamber calorimeters, one could determine the gaseous exchange which is coincident with that heat production and could thus, from the known caloric values of units of oxygen and carbon dioxide, calculate the metabolism of an individual under observation.

Various apparatus were devised toward this end, but it was not until about 1908, when Benedict introduced his first closed circuit, "tension-equalizer" apparatus (1), and even later, when in 1911 the same worker developed his first spirometer type of apparatus (2), that there was even a hope for the clinician that this important field might become of more than abstract scientific value to him. With the subsequent improvement and simplification of these earlier apparatus (3, 4), the determination of the basal metabolism became a practical thing.

While indirect calorimetry had been done for years before, its difficulties are attested by the paucity of the data available for that time, and it is due almost wholly to Benedict's work that the subject received the impetus which has made it of practical rather than academic value.

Direct calorimetry, i.e., the actual measurement of the total heat production in one or another form of chamber calorimeter, is still the method of refined scientific research and is, of course, the standard by which any other method must be weighed and tested; and it will always be so. But it has been shown without room for doubt that indirect calorimetry, under the conditions commonly prevailing in clinical work, gives results quite comparable to those obtained by the more involved method; and it is this phase of the subject (in so far as methods are concerned) with which we will deal here.

The apparatus intended for routine clinical use and designed to

determine one or both of the factors involved in the gaseous exchange, i.e., the oxygen consumed and the carbon dioxide liberated in the process of respiration, are rather numerous. Most of them, as typically represented by the Benedict spirometer type, determine the amount of oxygen consumed in a given period of time; some, as typically represented by the Tissot gasometer and Haldane (or other) air analysis apparatus, in addition to determining the oxygen consumption, also measure the liberated carbon dioxide and thus make it possible to calculate the respiratory quotient for the subject under observation at that particular time; and one designer has rather ingeniously reversed the process and determines the time necessary for the consumption of an initially measured volume of oxygen. All of these apparatus offer rather serious difficulty of one kind or another in actual operation; and the writer, in addition to having used practically all of them, has been working since August, 1920, with an apparatus designed to determine only the carbon dioxide output. There is nothing new in this idea, of course; various workers in the past have used it; but the procedure, by reason of its inherent simplicity and ease of application, has several distinct advantages over any method based on oxygen consumption, and it is intended, in a subsequent paper from this laboratory, to present data showing the value of the method.

All determinations of basal metabolism are expressed, primarily, in calories per unit of time. Such an expression, however, gives no means of comparing results obtained for different individuals, or even results obtained for the same individual at different times; the factors of age, sex, and body mass all play an important part in determining any given individual's total metabolism, and it is readily seen that some procedure, by means of which the metabolism can be referred to some physical attribute common to all individuals, is necessary for the desired comparisons. It had long been believed that body surface was the factor to which metabolism could most properly and correctly be referred, but the difficulties attending the actual measurement of body surface were such that resort was had to various formulas proposed by various workers. None of these were more than approximations, none were satisfactory, and it was not until 1914, when Du Bois and Du Bois devised their "Linear formula" (5) with its attendant nineteen body measurements, that it became possible to accurately determine the body surface.

Later, in 1916, the two Du Boises further simplified the procedure and devised a formula for determining the body surface when height and weight are known (6). This formula was stated to have a maximum variation of plus or minus 5 per cent when applied to bodies of unusual

conformation, and of only plus or minus  $1\frac{1}{2}$  per cent for bodies of average conformation; and it made possible the easy and accurate determination of the body surface from but two factors very readily obtained.

Following the above described work of the Du Bois, a great number of metabolism studies have been made with a view to determining the propriety of referring metabolism to body surface; these studies all tend to show that such a relation is proper; and practically all work now done is calculated on a basis of *calories per square meter of body-surface per hour*. Very recently, however, Benedict and Talbot (7), in a report of an extended research on the metabolism of children, present data showing that, up to the onset of puberty, the basal metabolism of the two sexes can be more correctly referred to weight alone than to age and body surface; and it is probable that the reference of metabolism to body surface is more properly restricted in its application to the years from puberty on.

Any metabolism determination must take into consideration the respiratory quotient of the subject at the actual time of the observation, as the values, in calories, for both oxygen consumed and carbon dioxide eliminated, vary with the material undergoing oxidation. The respiratory quotient, as will be recalled, is the ratio of the volume of carbon dioxide liberated to the volume of oxygen consumed, i.e.,  $\frac{\text{volume CO}_2}{\text{volume O}_2}$ ; and it varies, of course, from the value 0.7 obtained in oxidation of fat alone to the value 1.0 obtained in oxidation of carbohydrate alone.

Proteins lie intermediately between these two figures; and, in estimating the respiratory quotient for proteins, it must be borne in mind that they vary somewhat in composition and that they are not completely oxidized in the body. Allowing for the unoxidized carbon and hydrogen escaping in the urine and feces, an average figure of 0.801 has been obtained for the respiratory quotient in protein oxidation. Under distinctly abnormal conditions, the respiratory quotient may rise above 1.0 (as in over-ventilation of the lungs) or may fall below 0.7, but such conditions are rare and of comparatively little concern to the worker in clinical determinations of basal metabolic rates.

Theoretically then, the respiratory quotient should be determined for each subject at the time of each determination of his metabolic rate; but it is well known that the respiratory quotient very closely approximates 0.82 under conditions of bodily rest and cessation of digestive activity, as in the fasting-resting state upon which all determinations of basal metabolism depend. It is sufficient, therefore, for practically all clinical work to assume a respiratory quotient of 0.82; and it is on the caloric values of oxygen or of carbon dioxide at this figure

that basal metabolic rates (when determined by either oxygen consumption alone or carbon dioxide elimination alone) are now almost universally calculated.

The value of 1 liter of oxygen, at a respiratory quotient of 0.82, is 4.825 calories; while the value of 1 gram of carbon dioxide, at the same respiratory quotient, is 2.996 calories, using in each instance, of course, the large calorie. These figures, once either the oxygen consumed or the carbon dioxide eliminated is determined, give a ready means of calculating the heat production of the subject under observation; and, given a sufficiently accurate method for making such determinations, the problem becomes a fairly simple one.

So much for the purely technical, or laboratory, phase of our subject. Let us turn now to the patient on whom we are to make a basal metabolic rate determination, and, incidentally, to the clinician who requests the procedure. It is well that the clinician understand at least the principles underlying *all* the laboratory methods he invokes to aid him in his work, for such an understanding not only makes for an appreciation of the difficulties and limitations inherent in any given procedure, but also for a more rational interpretation of the report he receives; indeed, it may save him from the all too frequent mistake of asking impossible things of his confrere in the laboratory. But this knowledge of the principles involved is almost essential in the realm of basal metabolic rate determinations, for here so much depends on the actual condition of the patient, mental as well as physical, and his cooperation is so necessary and, unfortunately, so often difficult to obtain, that the clinician can, if he will, frequently aid materially by preparing his patient for what will be expected of him. The procedure is at best a painstaking and time-consuming one, and much wasted time and effort can be saved if the subject is properly informed beforehand as to his part in the determination. But the clinician can give this information only if he himself knows it.

Ideally, to determine the basal metabolism of a body would require the attainment in that body, of four conditions:

1. Complete cessation of all voluntary work or movement.
2. Complete absence of all phases of metabolism having to do with the digestion, and transportation and utilization within the body, of ingested food.
3. Complete and perfect elimination of all accumulated waste products of metabolism, so that none of these might serve to put upon the body or any of its organs any burden of work beyond its bare maintenance.
4. Complete cessation of all truly mental activity, for, while the coordinating and regulating activities of the central nervous system are

necessary to the maintenance of the body, mental activity is not. It is certainly conceivable that all mental processes are a form of metabolism, and as such, under the strictest use of the term "basal," they should be excluded.

Of course, such an ideally basal condition is practically impossible of attainment, and for this reason certain workers have said that it is folly to speak of a "basal" metabolic rate, but the term has acquired a certain definite meaning and has come to stay.

Of the four conditions enumerated above as being essential to the attainment of a truly basal state, the elimination of muscular activity is by far the most important, since this factor, when present during a determination, serves to so increase the metabolism as to make such a determination valueless. For practical purposes the first two conditions mentioned are all that need be fulfilled, for, given the absence of all voluntary movement and the elimination of all digestive processes, the mental activity can be kept minimal; and waste products, unless of such a nature as to amount practically to a poison, can, at least in the light of our present knowledge, be ignored. It is generally agreed by physiologists that practically all digestion and body-handling of food previously ingested are completed within twelve to fourteen hours after ingestion; and it has also been found that, in the absence of any great amount of exercise or exertion, a complete rest of from one-half to one hour's duration is sufficient for the fasting body to attain the desired resting, or "basal," condition. It has been the experience in this laboratory that one-half hour's rest (invariably lying down) is usually sufficient, especially where the exercise during the preceding several hours has been minimal. This matter of the preliminary rest required is subject to some variation in different individuals, however, and the operator must attempt in any given case to strike the happy medium which will insure minimal metabolism and yet will not pass beyond the state of rest and, by "fretting" the subject, defeat the very end desired.

It is to be borne in mind that this preliminary period must be one of absolute rest and relaxation; it is surprising how little activity or movement on the part of the patient may serve to noticeably increase the rate. And, inasmuch as we find at present the greatest application of this procedure in cases in which there is considerable nervousness, it is often of extreme importance to reassure the subject and to attempt, by every means possible, to secure his full cooperation in the effort to obtain complete mental as well as physical quiet. This need can hardly be over-emphasized.

The desired result, then, of the "fasting-resting" state is routinely



obtained by having a proposed subject for the basal metabolic rate determination eat a comparatively light supper or dinner at the usual time on the evening preceding, with no further food until after the determination is made, which is usually the following morning.

The subject then repairs, with as little exertion as may be, to the place of examination, where he is made comfortable and required to rest for the period considered necessary—usually recumbent and, of course, on the couch or other support on which he is to lie while undergoing the determination. It may be well to caution here that one of the greatest aids toward securing real quiet on the part of the patient and toward allaying any apprehension he may feel is to have everything ready for the determination before his arrival, thus eliminating all excitement as a result of the preparations going on around him. This is an important factor, especially in the nervous patient suffering from hyperthyroidism.

It may also be well to say here, with reference to the prohibition of food mentioned above, that this abstinence from food must be absolute; nothing but water can be allowed, and even water, Benedict and Carpenter find (8), should be kept below 500 grams in amount, as greater quantities may cause an appreciable rise in metabolism. The morning cup of coffee so frequently indulged in must be particularly cautioned against, for many patients, even though quite willing to cooperate in every way, will, in the belief that it has no food value and with a view of preventing the headache sometimes resulting from failure to eat breakfast, compromise by drinking their habitual cup or cups of coffee. And the result is a very considerable rise in the basal metabolic rate, which rise may persist for several hours and may prove a quite disconcerting factor in the reading obtained.

So much for the determination itself and the preparation of the patient therefor. Just a word as to what is considered normal, and as to how that normal is arrived at and expressed, and we are ready to pass to the clinical interpretation of departures from that normal. In predicting the normal for any adult individual of given age and sex, the basal metabolism is calculated, as previously stated, in terms of calories per square meter of body surface per hour, the body surface being determined from the individual's height and weight by means of the formula devised by the two Du Boises (6). In reporting a determination of the basal metabolism of such an individual, we might stop there and simply report the number of calories per square meter of body surface per hour for that individual, but this would give us no ready means of comparison, for, as has been said, the metabolism varies with age and sex, and to interpret such a report the clinician would have to have constantly at

hand, tables showing the normals, in calories per square meter of body surface per hour, for the two sexes at different ages. (In the cases of children, accepting the data of Benedict and Talbot referred to above (7), the metabolism would be referred to weight alone; and this would necessitate still another table showing the normals for children of the two sexes of varying weights.) In order to obviate this difficulty, the idea of *percentage variation* was introduced; and it is a simple matter for the laboratory worker to report, not the number of calories per square meter per hour (or per kilogram of weight per hour) but the percentage of variation of the subject from his predicted normal, this percentage being plus or minus according as the variation is above or below the normal. If there is no variation from the normal—i.e., should a subject's heat production be exactly that predicted for him—his percentage of variation would, of course, be zero, and the report made would be plus or minus 0 per cent. This percentage of variation from the normal is the basal metabolic rate.

Aub and Du Bois (9) have published a curve showing the level of metabolism at different ages, expressed in calories per square meter of body surface per hour, and from this curve have constructed a table giving the normal standards, in these terms, for the two sexes at different ages from fourteen to eighty years. This curve and table are the accepted standards for normality at present, and, while they are of course subject to possible future revision as more data are accumulated, the amount of work on which they are based, as well as that done subsequently, would seem to assure their accuracy, at least for the years following pubescence. For the period preceding puberty, it is probable that the figures of Benedict and Talbot, as given on page 206 of their paper already referred to (7), and based on weight alone, will be accepted as standard.

Coming now to the clinical interpretation of variations from the average normal in the basal metabolic rate, it should be said that the procedure has only so recently become susceptible of anything approaching a general application to clinical work that its limits of value, and the more detailed division of its pathological ranges, are still more or less undetermined; and there is, further, a very real lack of literature on the subject. While the latter condition will doubtless be remedied by a flood of reports—which is, indeed, beginning now—the final limitations of the procedure can only be determined in the future.

There is a certain parallelism between the basal metabolic rate and the body temperature. Just as there are conditions in which we find rather constantly a subnormal, normal, or increased temperature, so are there conditions in which we find a subnormal, normal, or increased basal

metabolism; and it is true in general, as, indeed, we might expect to find that febrile conditions are accompanied by a definite rise in the rate, while the opposite condition, represented by inanition from any cause, is characterized by a lowered rate.

As has been said, the average normal basal metabolism has been determined for the two sexes at various ages. In this connection it must be borne in mind that, just as there are individual variations in the so-called "normal" temperature—which variations are ignored by the observer—so are there individual variations in the normal metabolism for the same sex and age; and these variations can likewise be ignored.

In other words, while we say that the average normal temperature is 98.6° F., no clinician pays attention to variations between 98° and 99°, and any temperature between these or even wider limits is considered normal. Likewise, while we speak of an average normal basal metabolism for a given sex and age, and expect practically all subjects to conform fairly closely to that normal, we need not be surprised that there is a range of individual variation from that average. In like manner, just as there are daily and even hourly variations in the temperature, so are there similar variations in the basal metabolism of any given individual.

The usual range of variation from the several calculated averages has been rather generally stated to lie within the limits of plus or minus 10 per cent, but it is the feeling in this laboratory that the limit of "normal" on the plus side should be, perhaps, 15 instead of 10 per cent. At first thought, these limits of allowable variation from the predicted normal—i.e., minus 10 to plus 15 per cent—may seem unduly wide, even, perhaps, sufficiently so as to invalidate the whole procedure. Indeed, clinicians have been heard to say, in effect, that "if we could not come closer than that" the procedure must be worthless. But, recalling the parallel previously drawn between variations in the basal metabolic rate and those in the body temperature, and bearing in mind the much greater total variation met with in basal metabolism than in temperature, it will be readily seen that the percentage of allowable variation in the basal metabolic rate range is not greater, if not actually less than that in the temperature range.

Understanding, then, that there is a more or less sharp division of the basal metabolic rate into three ranges: Those below normal—i.e., rates below minus 10 per cent; those within normal limits—i.e., between minus 10 and plus 15 per cent; those above normal—i.e., above 15 per cent; we can proceed to a discussion of the clinical meaning of rates lying outside of the normal limits. As previously stated, the subject is yet young; and, while we may later reach a point where small differences

in rates may be of value, that stage is not now; and we are at present concerned in knowing, not whether a patient's rate is, for example, plus 15 or plus 17 per cent, but whether it is plus 15 or plus 40 per cent.

An individual's level of metabolism may vary several per cent from day to day or even, perhaps, throughout the same day; but despite this limitation—if limitation it be—the procedure has already attained a very considerable value; and it has taken a very definite place in the diagnosis and treatment control of certain disturbances of the endocrine system, with particular reference to the thyroid gland and the differential diagnosis between thyroid pathology and the purely nervous disorders which so often, and so closely, simulate it.

In general—following Plummer in his classification of thyroid disorders (10)—exophthalmic goiter gives the highest basal metabolic rates yet encountered; in this condition, rates as high as plus 60 or 70 per cent are not uncommon, and rates well over plus 100 per cent have been reported. It is to be emphasized that a single finding of a high rate, especially in the absence of rather definite clinical findings, may mean practically nothing, for too many factors may cause this; but a *sustained* and reliably arrived at rate of plus 40 per cent or over (not the result of fever) is believed to be practically diagnostic of exophthalmic goiter. On the other hand, a single low finding does not certainly exclude hyperthyroidism—we have all seen early cases of exophthalmic goiter which were definitely remittent, if not intermittent—and, remembering that the patient in question may belong in this class, it is well to repeat the determination at intervals of several weeks or a month in any clinically suspicious case on which an initial low rate is obtained.

The cases of toxic adenoma, in which we have a pure hyperthyroidism and in which there is rather a quantitative than a qualitative change in the thyroid function, also give an increased rate, but the rate here is generally lower than that met with in the exophthalmic goiter cases, lying usually between, say, plus 15 per cent and plus 35 per cent. There is, of course, a certain amount of overlapping of these cases with the normal on the one hand and exophthalmic goiter on the other, and repeated determinations, with the most careful clinical study, may be necessary to properly classify them.

There is a certain definite agreement in hyperthyroidism (and this applies particularly to exophthalmic goiter) between the basal metabolic rate and the severity of the disturbance, this severity being measured, not by the clinical picture, but by the actual metabolic stress under which the patient is laboring and the additional such stress to which he may safely be subjected. This fact gives us, in the basal metabolic rate, a very definite and an exceedingly reliable guide as to the degree

of surgical stress which any given case will stand; and Boothby (11), writing from the Mayo Clinic with reference to surgical treatment of exophthalmic goiter, states that "As a general rule, preliminary ligations are less frequently indicated in patients with rates below plus 50 per cent and very rarely in patients with rates below plus 40 per cent."

By the same token, we have an almost indispensable guide throughout the continued treatment of these cases, whether this treatment be medical, surgical, or by the use of the X-ray; and there is now possible a feeling of confidence and certainty in the handling of these cases which is in welcome and gratifying contrast to the previous method of trial and error—a method entirely uncontrolled except by the patient's observable reaction to the measures instituted. And, as we all know, this reaction was only too often very definite proof that the treatment had been carried too far. This use of basal metabolic rate determinations—i.e., as a guide in treatment control, of both hyper- as well as hypo-endocrine disorders—is probably its most important one, and of more value even than its use in diagnosis.

With regard to the differential diagnosis between thyroid disturbance and nervous conditions simulating it, it may be said that, while the latter frequently give an initial reading as high as many obtained in hyperthyroidism, none of them show a *sustained* high rate on repeated examination. Given a case, for example, in which there is doubt as to whether the condition is exophthalmic goiter or a psycho-neurosis, the principal differential points, as manifested in the basal metabolic rate, would be somewhat as follows:

In the exophthalmic goiter, an initial high basal metabolic rate is obtained, which rate is confirmed on repeated determinations at one or two-day intervals. Of course, in a comparatively early case undergoing clinical remission, the initial rate may be low, though seldom if ever normal. In such a case, the clinical exacerbation in the course of weeks or months, with an increased rate during this stage of over-activity, would serve to make the diagnosis.

The psycho-neurosis, clinically resembling hyperthyroidism, may give an increased rate in the initial determination, though oftentimes, despite the very evident nervousness, the initial rate is quite normal. Where an initial high rate is obtained, this is not sustained on repeated determinations; successive examinations at one or two-day intervals may show a steadily falling rate (e.g., plus 40, plus 30, plus 15 per cent, etc.) until a normal is reached and maintained; in some cases the normal rate may be obtained as early as in the second determination.

Non-toxic, simple goiter does not give an increased rate, nor does the adolescent goiter. Here we find the procedure of value in the differential diagnosis, for many simple goiters are seen, especially in women, which are accompanied by varying degrees of the "nervousness"

and other disturbances which go to make up the picture classically associated with thyroid disturbance. It is extremely helpful, in these cases, to have a knowledge of the metabolism level; for in this level, as expressed in the basal metabolic rate, we have practically our only reliable guide as to the extent of the thyroid's participation in causing any given clinical picture.

In myxedema, the opposite of hyperthyroidism, the basal metabolic rate is quite low, though seldom falling below minus 30 per cent. Here again, as indicated above in discussing the control of the treatment of hyperthyroidism, we have a really scientific guide in our treatment of the hypothyroid, and we need no longer give our thyroid principle in the constant fear of producing hyperthyroidism. In the light of the basal metabolic rate determinations, we can arrive at an exact dosage necessary to bring a given case up to normal and to keep him there; and then, by repetition of the determination at intervals of several months or longer, can judge his condition correctly and accurately under the long-continued treatment which these cases require.

Disturbances of the pituitary gland have been studied under this procedure (12, 13); and cases of hyperpituitarism have been found to give an increased rate, while the hypopituitary cases give subnormal rates, the variations from normal, however, being nothing like so great as those met with in the corresponding thyroid disorders. These studies of pituitary dysfunction have been relatively few in number, and definite conclusions, therefore, can hardly be drawn as yet.

Menstruation may or may not increase the basal metabolic rate, but is usually associated with some irregularity of the rate during the period, this observation coinciding with that of other workers (13). The irregularity of the metabolic level noted during the menstrual period seldom if ever goes beyond quite normal limits, and it is the impression in this laboratory, based on four subjects whose metabolism has been studied both during and between menstrual periods, that the variation possibly referable to menstruation lies within the normal daily variation for women.

As has already been stated, fever, from any cause, will give an increased basal metabolic rate, which is, of course, what we would expect from our conception of the nature of fever; and it is interesting to note, as Du Bois has recently shown (14), that the metabolism in fever rises with increasing body temperature in accordance with the law enunciated by Van't Hoff governing the velocity of chemical reactions. On the other hand, in any condition of the opposite type—i.e., where we have what for lack of a better name we might call inanition—the rate is below normal. These two facts, at least in a measure, account for the inconsistent results obtained in so many conditions characterized by

fever on the one hand, or by an abnormally lowered vitality on the other. Among these might be mentioned tuberculosis and diabetes mellitus; and it should cause small wonder that in such conditions as these, where so many interrelated factors go to make up the picture as a whole, we should find the basal metabolic level an inconstant one.

With regard to tuberculosis, McCann and Barr (15) state that: "The basal metabolism of tuberculous patients may be normal or very slightly above that of normal men of the same size. Thus, in ten cases, the variation from average normal was from minus 3 to plus 15 per cent." The same workers add the further observation that "The basal heat production in tuberculosis may be less than the normal for the same patient when in health; in other words, the loss in weight may be accompanied by a reduction in metabolism which more than compensates for the tendency to increase caused by the disease."

The one case of diabetes studied in this laboratory has shown little or no departure from the normal limits for her age and sex, and this finding is in accord with that of other workers. Allen and Du Bois (16) state that ". . . increase of the basal metabolism above the true normal level in severe diabetes is generally absent or slight. The metabolism was shown to fall markedly during fasting to 20 per cent below normal. The level of metabolism in diabetes is the resultant of a number of forces: for example, increased destruction of protein and perhaps other processes tending to increase metabolism, and undernutrition; muscular relaxation (as in prolonged confinement in bed) and other possible conditions tending to diminish metabolism. According as one or the other of these groups of forces predominates, a higher or lower metabolism may be expected in any individual case of diabetes."

Numerous other conditions are, of course, being studied in the light of their basal metabolic rates, and various workers are listing various diseases as being characterized more or less definitely by an increase or decrease in their rates. Cardiac conditions, unless decompensated, cause no appreciable variation from the normal; where decompensation is marked, there is an increased metabolism, and this increase is more or less proportional to the degree of decompensation present, with the consequent increase in muscular work performed.

No disturbance of the metabolism level has been consistently observed in nephritis, and from the number of cases studied it would seem a fair conclusion that this condition, uncomplicated by other factors, does not cause a departure from the normal limits.

Simple obesity, i.e., obesity not associated with demonstrable endocrine disturbance, shows no change in the level of metabolism.

Pernicious anemia, and both lymphatic and myelogenous leukemia, are all characterized by a metabolism increased above the normal, the

increase being more or less proportional to the severity of the disease. In general, for approximately similar grades of severity, the leukemias give rates higher than those for pernicious anemia (17).

So much for the relation of basal metabolism to the principal diseases in which it has been studied. Physiological research has shown conclusively that the body metabolism is under the control of the internal secretory glandular system; and the more recent years, with their greatly increased work on basal metabolism in various pathological conditions, have proven the thyroid to be at least the principal regulator of the body's heat production. Because of this fact, and also because of the relative frequency with which derangements of thyroid function are encountered, it is in the differential diagnosis and treatment control of thyroid disturbances that the determination of the basal metabolic rate finds by far its greatest use today. This is in no sense a narrow field, however, nor one of little value; as will be readily appreciated by all who have faced the problem of determining, in a given case, whether or not there was thyroid involvement, as well as by those who, having made their diagnosis, have had to determine the nature and extent of the treatment which would promise best results.

And now, finally, a word of caution regarding the entire subject of basal metabolism and the basal metabolic rate in medicine. The procedure is not a fool-proof one; it belongs essentially to the laboratory, and it will never be otherwise. As in most other laboratory procedures, there are certain cases in which its findings may make the diagnosis quite definitely and positively; but the majority of cases must be considered in the light of *all* the findings, both clinical and laboratory. While the basal metabolic rate is often an important *part* of the total picture, it is seldom *all* of the picture necessary for an intelligent diagnosis; and failure to realize this will only bring the procedure into disrepute, quite undeserved, it is true, but just as certain as that which has featured the history of so many other laboratory procedures in the past. It is simply the old story—the clinician has had made available to him a new laboratory method; if the limitations and proper application of the method are realized, and the clinician can be prevented from relying wholly and too implicitly on the findings obtained in any given determination of the basal metabolic rate, the procedure will find and take its proper place in both diagnosis and treatment control. If, however, this is not done (and, unfortunately, certain manufacturers of apparatus designed for determining the basal metabolism are ignoring these facts in their selling propaganda), discredit of the procedure is sure to follow, and it will undeservedly suffer in the opinion of the medical profession at large.



It cannot be too strongly emphasized that a high rate obtained on a *single* determination *may mean nothing*, even when apparently supported by the rest of the clinical picture. To be of any real value in diagnosing hyperthyroidism, the rate indicating an increased metabolism must be sustained on repeated examination; an initial high rate *always* demands confirmation. Eternal care and infinite attention to detail are absolutely essential in making the actual determinations, and a reasonable amount of common sense in interpreting the results obtained is just as necessary as are the findings themselves.

## BIBLIOGRAPHY

- (1) Benedict: Amer. Jour. Physiology, 1909, 24, p. 345.
- (2) Benedict: Deutsch. Archiv. f. klin. Med., 1912, 107, p. 156; and Carpenter: Carnegie Inst. Wash., Pub. 216, 1915, p. 34.
- (3) Benedict: "A Portable Respiration Apparatus for Clinical Use." Boston Med. and Surg. Jour., vol. 178, No. 20, May 16, 1918.
- (4) Benedict and Collins: "A Clinical Apparatus for Measuring Basal Metabolism." Boston Med. and Surg. Jour., vol. 183, No. 16, October 14, 1920.
- (5) Du Bois and Du Bois: "The Measurement of the Surface Area of Man." Arch. Int. Med., May, 1915, vol. 15, No. 5, part 2, p. 868. (\*)
- (6) Du Bois and Du Bois: "A Formula to Estimate the Approximate Surface Area if Height and Weight Be Known." Arch. Int. Med., June, 1916, vol. 17, part 2, p. 863. (\*)
- (7) Benedict and Talbot: "Metabolism and Growth from Birth to Puberty," Carnegie Inst. Wash., Pub. 302, 1921.
- (8) Benedict and Carpenter: "Food Ingestion and Energy Transformations, with special reference to the Stimulating Effect of Nutrients." Carnegie Inst. Wash., Pub. 261, 1918.
- (9) Aub and Du Bois: "The Basal Metabolism of Old Men." Arch. Int. Med., May, 1917, vol. 19, No. 5, part 2, p. 823. (\*)
- (10) Plummer: "Interrelationship of Function of the Thyroid Gland, and of Its Active Agent, Thyroxin, in the Tissues of the Body." Jour. A. M. A., vol. 77, No. 4, July 23, 1921.
- (11) Boothby: "The Fundamental Classification of Disease by the Basal Metabolic Rate." Jour. A. M. A., vol. 76, January 8, 1921.
- (12) Means: "Studies of the Basal Metabolism in Obesity and Pituitary Disease." Jour. Med. Research, 1915, vol. 32, p. 121.
- (13) Snell, Ford, and Rowntree: "Studies in Basal Metabolism." Jour. A. M. A., vol. 75, No. 8, August 21, 1920.
- (14) Du Bois: "The Basal Metabolism in Fever." Jour. A. M. A., vol. 77, No. 5, July 30, 1921.
- (15) McCann and Barr: "The Metabolism in Tuberculosis." Arch. Int. Med., Dec., 1920, vol. 26, p. 663. (\*)
- (16) Allen and Du Bois: "Metabolism and Treatment in Diabetes." Arch. Int. Med., June, 1916, vol. 17, part 2, p. 1010. (\*)
- (17) Meyer and Du Bois: "The Basal Metabolism in Pernicious Anemia." Arch. Int. Med., June, 1916, vol. 17, part 2, p. 965. (\*)

\* All references thus marked are included in the series of papers on "Clinical Calorimetry," from the Russell Sage Institute of Pathology.

## NOTES ON THE HISTORY OF MILITARY MEDICINE

(Continued from March, 1922)

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### VI. THE SEVENTEENTH CENTURY

THROUGH the 16th and 17th centuries the spirit of individualism gained complete ascendancy, and collectivism went into decline. The 17th century was an age of extraordinary activity in science, literature and art, while practice of medicine, hospital management, and organized care of the sick and wounded sank to a very low level. The centric achievement of 17th century medicine was the demonstration of the circulation of the blood by William Harvey in 1616 and his publication of the same in 1628. This great event, the starting point of modern experimental physiology, was accompanied by an impressive array of anatomical discoveries, each of physiological significance and led to the solution of the main elements in the problem of the physiology of respiration by a number of English chemists. Descartes outlined the theory of reflex action. The principles of the physiology of vision were elucidated by astronomers and mathematicians. The only work in the physiology of digestion before the time of Beaumont was accomplished by Peyer, Brunner and de Graaf (pancreatic and biliary fistulæ). In the hands of Kircher, Hooke, Leeuwenhoek and Malpighi, the microscope became a powerful aid to medical science. The foundations of medical jurisprudence and of vital statistics were well and truly laid, and internal medicine, while generally backward, was eventually associated with such great names as Sydenham, Willis and Franciscus Sylvius. Many new diseases were described. The relation between typhus fever and pediculosis was noted in army camps by Tobias Cober in 1606. Some of the greatest medical men of this century, such as Harvey, Descartes, Willis, Sydenham, Wiseman and Purmann, served in armies. In 1633, Stephen Bradwell published the first book on first aid in sudden accidents.<sup>1</sup> Some 30 books on contagious diseases in armies were published, the most notable being the *Medicina Militaris* (1620) by Raimund Minderer (of spiritus Mindereri).

The wars of the period were the religious wars already mentioned, the English Parliamentary Wars and the struggle between the Dutch and

<sup>1</sup> S. Bradwell. *Helps for Suddain Accidents endangering Life*. London, 1633. It treats of poisoning, including that from mushrooms and shellfish, venomous bites and stings, falls from high places, strangling, drowning, suffocation, choking, scalding, burns, and foreign bodies in the throat or gastrointestinal tract, including snakes and worms. The directions are quaint but practical. A similar tract of 23 chapters, prepared by Daniel Ludwig (1625-80) at the instance of Duke Ernst I of Saxe-Gotha, and published in 1685, is described by Töply as an inferior production. (*Militärarzt*, Wien, 1886, XX, 209-211.)

the English on the seas for the control of commerce, in particular of the drug trade.

This lucrative phase of maritime activity was a natural outcome of contact with the East through the Crusades and its origins are intimately connected with the facts set forth in Mr. Wells' chapter: "Land Ways give place to Sea Ways." In the Middle Ages, the Eastern drug trade was in the hands of the Venetian Republic, which already controlled the Mediterranean transport service during the Crusades. When Vasco de Gama doubled the Cape in 1498, the Portuguese gained their opportunity and Lisbon became the central mart for drugs and spices during the 16th century. After 1596 the Dutch, who controlled the maritime freight service between Northern and Southern Europe, gained the jealously guarded secret of the sea-route to the East, through the publication of Linschoten's travels, and once they had worsted the Portuguese in naval warfare, resorted to every device to monopolize the clove and nutmeg. As Motley observed, the world's destiny seemed to hang upon "the growth of a particular gillyflower." The clash between the Dutch and the English began about 1622-23, but the English had already gained a decisive foothold in the Indies through the chartering of the British East India Company on December 31, 1600.

The military medicine of the period shows no great advance over that of the 16th century, due to the rigid divorce between medicine and surgery, started by Galen, maintained by the Arabians, standardized by the ecclesiastical interdictions of the Middle Ages, and now become codified custom. The bitter rivalries between physicians, surgeons and barbers continued, and while the physician had the best of it, styling himself a *medicus purus*, he was usually as Molière has represented him, a sterile pedant and coxcomb. In England internal medicine was nothing to speak of before the time of Sydenham (1624-89). As always happens in an age in which scientific medicine is ardently followed by the elect, the folk-medicine of the period became more ludicrous and contemptible than that of primitive man. The therapeutic devices of the 17th century reveal a distinct backward trend in internal medicine. The pharmacopœias of the time were very aptly styled "filth-pharmacopœias," as being made up of the most nauseating and loathsome ingredients, usually compounded from the parts of different animals. Writers on military medicine are singularly reticent as to the contents of the vaunted field medical chests of the period, some of which contained no less than 284 remedies, including oils of vipers and angle-worms, beetles, ear-wigs, powdered mummy, etc.<sup>2</sup> Mme. de

<sup>2</sup> A field-chest devised by Muralt for the Bavarian artillery in the Turkish campaign of 1683 is described by J. Schuster (*Deutsche mil.-Ärztl. Ztschr.*, Berl., 1916, XLV, 123-131). It weighed 320 pounds and contained 30 surgical instruments and matériel, with 197 remedies, including 3 pounds of theriac (an opiate antidote of 64 ingredients), mithridate (19 ingredients), tincture of bezoar, Pannonian powder (mostly red sandal-wood), *puleia ad casum* (i. e., for any emergency, containing rhubarb, *terra sigillata*, palm-juice, spermaceti and mummy dust), scorpion oil, rainworm oil, zinc oxide, Vigo's plaster of frog-spawn and mercury, human fat, dog's fat, rhubarb, jalap, aloes, senna, tartar emetic, Peruvian bark, mercurials, sugar of lead, alum, guaiac, saffron, squills, cantharides, hartshorn, sal ammoniac, camphor, opium, etc.

Sevigné was enthusiastic about urine as a remedy. Sir Kenelm Digby's "sympathetic powder" for healing wounds at a distance, and the "weapon-salve" applied to the weapon instead of the wound, were employed everywhere with portentous seriousness, showing the discontinuity of the popular mind in medicine, then as now. The worthwhile surgeons of the entire century—Wiseman, Fabry of Hilden, Purmann, Scultetus, Zambecari—can be counted on the fingers of one hand. Surgical instruction was so poor that, as all the authorities of the time opined, war was the only field in which it could be learned. The only other alternative for the apprentice, to ship as surgeon on a whaling vessel to Greenland, was worse than nothing. Difficult operations were seldom essayed, as endangering the surgeon's personal welfare or entailing the loss of his practice. The surgery of the people and of the common soldier remained in the hands of the barber, the bath-keeper, the strolling fly-by-night quack who attended fairs, and to these was now added the grim figure of the executioner or headsman, whose skill in breaking bones on wheels and other phases of judicial torture<sup>3</sup> was supposed to render him expert in bone-setting. Over all these, the scholastic physician, of pedantic, pompous type, lorded it with becoming dignity. In France, exemplary respect for "the physician, our masters" was enjoined upon the surgeon, who did not attain his independence from physicians and barbers until 1743. In Prussia, public examinations to test the fitness of surgeons were not required prior to the first medical edict of Mark Brandenburg (1685). The arbitrary separation of medicine from surgery was rigidly enforced in the field, the physician attending to internal complaints while wounds were left to the barber. The ultimate practice of having Physicians General and Surgeons General at one and the same time could only result in decentralized administration, both in the armies of Frederick and Washington.

In the 17th century, the mediæval aspiration toward nationhood had become accomplished fact and standing or national armies existed in France, Austria, Sweden, Russia and the Mark or Electorate of Brandenburg (later Prussia). The main advances in military science were the subdivision of large masses of troops into tactical units or battalions of 600-800 men each, introduced by Gustavus Adolphus, the gradual substitution of musketry for pikes and halberds, with more efficient artillery. In consequence of these changes, battle lines were spread over

<sup>3</sup> Torture as a mode of compulsion or punishment was not abolished in Prussia until 1740, in Saxony until 1770, in Austria until 1776, in Holland until 1798. In other countries, it died out indefinitely, never existing in Sweden, where it was expressly forbidden in 1734. For the many refinements of cruelty which were sanctioned in the name of "judicial torture," see the illustrations in H. Quanter: *Die Leibes- und Lebensstrafen bei allen Völkern*, Dresden, 1901.

wider surfaces by deploying troops in thin, open-order arrangements. Under Gustavus Adolphus, the soldier's burden of heavy armor and equipment was much reduced in weight, the manual of arms was highly specialized and the cavalry arm regained its prestige as "squadrons of horse" (*Reiterer*), armed with swords and pistols instead of lances. The French inventions of the flint-musket (1635) and the bayonet (1640) further influenced the fortunes of war. Gustavus Adolphus was more forward than any other military leader of the time in proper consideration for the sanitary welfare and medical treatment of his men, and was the first to uniform his regiments completely. In this period, the army surgeon acquired a definite uniform, destined to become the distinctive costume of the practising physician in the 18th century, consisting of a tight-waisted *justaucorps* coat, reaching to the knees, with the usual small clothes, stockings and buckled shoes. Specimens of these coats were exhibited at Dresden in 1911,<sup>4</sup> and they are frequently depicted in the surgical treatises of Purmann and Heister.

The wars of the 17th century, in particular the Thirty Years War (1618-48) and those waged by Louis Quatorze (1672-97) were of extraordinary duration. In considering their effects upon military medicine, it will be convenient to arrange the scattered material under the different countries.

### France<sup>5</sup>

The ambulance hospital established at the siege of Amiens by an edict of Sully, minister of Henri IV (November 25, 1597), had been preceded in order of time, by the field tents or camp hospitals of Queen Isabella (1487), a camp hospital at the siege of Rouen (1591), and others, but it was so well managed by Pigray, a pupil of Paré, that even officers preferred to be treated in it (Heizmann). It was, moreover, the starting point of a number of attempts on the part of Henri IV, Louis XIII and their ministers, to improve the condition of the wounded and disabled soldier by the foundation of permanent institutions. As long as the siege of Amiens lasted, Sully himself went there regularly each month with a fund of 1,500,000 crowns, a goodly portion of which was destined for the hospital, frequented mainly by officers and "persons of quality," while provisions were made for the care of the wounded in neighboring villages. By edicts of Henri IV (1604-11), the *Maison de la Charité chrétienne*, founded in Paris by Nicolas Houel, was opened to destitute and disabled soldiers, with funds and administrative board, and this privilege was further extended to widows and orphans of soldiers killed in battle; but after the king's death in 1610, the arrangement went into abeyance through lack of funds. Edicts of Louis XIII (1611-29), revived the ancient Carolingian *droit d'oblat*, in virtue of which disabled and infirm officers and soldiers were assigned as lay brothers (*frères laïcs*) to monasteries, where they eked out their existence as sweeps, gardeners and bell-ringers. In January, 1629, an ordinance of Richelieu established the first stationary hospitals in the rear of armies in the field, and a state document of 1630 demonstrates the existence of one of these base hospitals at Pignerol, with adequate medical and surgical personnel.

<sup>4</sup> Sudhoff: Dresden Catalogue, 1911, 319

<sup>5</sup> Cabanès: *Chirurgiens et blessés à travers l'histoire*. Paris, 1918, 116-200. Heizmann: *Ann. Med. History*, N. Y., 1916, 17, 1, 287-292.

Three years before, Richelieu had improved field hospital service at the siege of Rochelle (1627), by the addition of personnel to insure the distribution of soups and medicine to all who could or would not seek assistance. In 1638, Richelieu published another ordinance providing for priests and cooks to look after the sustenance of the sick and wounded who would not go to the field or sedentary hospitals. By 1633, he had advanced to the idea of founding a disabled soldier's home or *Maison des invalides*, construction of which was begun in August, 1635. But after dedication of the scaffolding with great *éclat* on September 27 of the same year, the project was suddenly abandoned and came to nothing before the definitive opening in 1676. The disabled *invalides*, who had paraded with great pomp on this occasion, were sent back to their monasteries to resume the pensioned status of the *oblat*. During the reign of Louis XIV, through the good offices of Cardinal Mazarin, Le Tellier, the Secretary of State (1677-85), and his successor Sublet de Noyers (1636-43), funds were frequently found for assisting the wounded in the field; military hospitals were established at Arras, Calais, Dunkirk, Perpignan and elsewhere, and the administration of the regimental and base hospitals, formerly in ecclesiastical hands, was placed under an intendant. Pensions of 30-50 livres were granted to disabled soldiers; officers received 300-400 livres. But, in spite of these remarkable advances, the condition of the wounded in the field and in hospital left much to be desired, while the streets of Paris and the larger towns swarmed with lame, crippled, infirm and mutilated soldiers, whose physical status, as depicted in the etchings of Callot, was that of squalid beggary. The poor construction and administration of the military and civil hospitals, which consisted of little else than spacious halls in which the squalid patients were crowded three in a bed, made them nests of infection, held out little attraction to those who could get along without them and engendered the well-considered horror of hospitals which persisted until very recent times. The funds disbursed for care of the wounded were frequently embezzled by officers, bent on libertinage in the capital, and many of the invalided preferred vagabondage to seclusion in convents. The increasing numbers of disabled mendicants in the capital finally induced Louis XIV to carry forward the old plan of a *Hôtel royal des Invalides*, which was at length established by an edict of April, 1674, with the Secretary of State for War as Director. The institution was opened in 1676, with the inscription "*Laeso et Inrieto Milite*" upon the imposing façade, but even here the inmates are described by Vauban, Langle and other observing spirits as "poorly clad, ill-nourished, crowded two in a bed, and a general eyesore to the public. None the less, these developments are of the utmost importance as precursors of the final stage in which care of the wounded and disabled became a permanent function of government. The base hospitals led to the establishment of permanent garrison and port (naval) hospitals in France, but nowhere else, and after 1666, Vauban designated places for hospitals in all captured towns of Alsace and Flanders which he was called upon to fortify. In 1667, Louis XIV held a conference with Turbière, Bienneise and Gayant on improving the medical service of the army in Flanders, to which these men, the ablest surgeons then in Paris, were assigned, Turbière with the title of "Surgeon Major Consultant of Camps and Armies." The medical personnel of the army had increased to the extent that at the battle of Seneffe (1674), the intendant Robert was able to assign 230 military surgeons to three villages, with nurses and material adequate for the care of large numbers of wounded. In 1683, it was ordered that the sick be lodged before officers in campaign.

#### *Sweden*<sup>6</sup>

Gustavus Vasa (1523-60) created the first standing army for his country, made up of regiments of 12 companies (400-500 men), each company being provided with a barber

<sup>6</sup> E. Knorr: *Entwicklung und Gestaltung des Heeres-Sanitätswesens*, Hannover, 1820, 652-660. Heumann; *op. cit.*, 292-294.

surgeon or "beard-shearer" (*Bardskürare*). At the same time, a navy was started, with a barber-surgeon for each ship. These barbers were organized into definite guilds, pledged to furnish medical personnel to the army in time of war. In 1613, each regiment of infantry had two barbers, each regiment of cavalry one. By an order of February 15, 1614, the personnel of an infantry regiment was increased to 3 company barbers and one regimental barber, at salaries which varied greatly with the times, viz., 8 thaler monthly in 1614, 48-80 thaler monthly in 1625. Under Charles IX (1611), a regimental barber received 40 thaler annually and 20 thaler for a uniform. Under Gustavus Adolphus, he received 150 thaler annually, 50 thaler for clothing and abundant supplies. In 1625, one of the Swedish regiments of cavalry had 16 companies of 125 horse each, with 4 regimental barbers at 30 thaler monthly and 16 company barbers at 15 thaler monthly. In the armies of Gustavus Adolphus, each regiment had at least 4 barber surgeons.

The Thirty Years War began with the battle on White Hill near Prague (November 20, 1620) and in the course of five years, was transferred to North Germany, where Tilly and Wallenstein gained ascendancy at the battle of Barenburg (1626). Toward the end of June 1630, Gustavus landed an army of 13,242 men in Germany, 6 regiments of these being Scottish troops. On September 17, 1631, he defeated Tilly at Breitenfeld. The scene of war was then transferred to Bavaria, which was terribly ravaged by both armies. Gustavus was killed at the battle of Lutzen (1632). He was the greatest military genius of his time, and his medical arrangements were remarkable.<sup>7</sup> Each general acted as commissary officer, distributing daily rations of bread and meat. Pillaging without leave was punishable by death; disputes over spoils were settled by turning the plunder over to the "next hospital;"<sup>8</sup> civil hospitals, schools, churches and mills were exempted from pillage, and one-tenth of the spoils was set apart for the sick and wounded in hospital. The sick and wounded were usually left in captured towns to be treated in local hospitals, and wagon transportation of the wounded was sometimes employed. Enemy wounded were gathered in camp and sent to hospitals in adjoining towns. There were several precursors of the Red Cross convention in the Thirty Years War, notably at the siege of Domitz (1631), the surrender of Magdeburg (1636) and at Görlitz (1641). In spite of the care and forethought of Gustavus, his armies were steadily decimated by dysentery, typhus fever and plague and the frightful mortality of the native population during the entire Thirty Years War was largely due to the spread of these diseases by wandering soldiery on both sides. The opposing Imperialist armies under Wallenstein had field-barbers at  $3\frac{1}{2}$  *Reichstaler*, ranking between muster-clerks and trumpeters or blacksmiths, a general field-barber being attached to the general staff. Recruiting was done by impressment of the lawless and worthless in towns, pay of sick soldiers was continued three months, "if the flag still waved;" but little is known of the arrangements for care of the wounded.<sup>9</sup>

### Brandenburg<sup>10</sup>

The fusion of the Mark of Brandenburg and the Duchy of Prussia under a Hohenzollern prince was not formally effected until 1701. In the armies of Elector George Wilhelm (1619-40), numbering 8,000 infantry and 2,900 riders, every regiment had a regimental barber and every company of infantry and cavalry a field-barber. His successor, the Great Elector (1640-88), created a standing army of 28,000-38,500 men, and increased

<sup>7</sup> For which see, Juh. Heilmann: *Das Kriegswesen der Kaiserlichen und Schweden zur Zeit des 30-jährigen Krieges*, Leipzig & Meissen, 1850, pp. 158, 192, 245, 269, etc., cited by Köhler.

<sup>8</sup> Among these was the Waldstein Soldiers' House, erected by Gustavus for wounded and infirm soldiers and richly endowed by Queen Christiana (Heilmann, op. cit., 269).

<sup>9</sup> See A. Köhler: *Berl. klin. Wochenschr.*, 1913, LV, 1082-1084.

<sup>10</sup> Knorr: *op. cit.*, 64-73.

the medical personnel by a cornet-physician (*medicus de cornu*)<sup>11</sup> and a staff barber, both attached to the general staff, while troops quartered in the larger cities had also garrison-physicians, who treated the officers for internal diseases and devised sanitary measures during epidemics, and garrison-barbers, who were ordinary wound-surgeons. Dispensation of drugs was in the hands of field-apothecaries, subordinated to a staff-apothecary. There were no hospitals at this time, the sick and wounded being treated in quarters. In the reign of Frederick I (1688-1713), the company-barbers, formerly subordinated to the captain of the company, became subalterns of the regimental barber. In the time of the Great Elector, the regimental field-barber ranked between a field-clerk and a drummer, and got 8 thaler as pay. According to Baas, a company barber got the equivalent of 11-15 marks monthly in the infantry and 11.40 marks in the cavalry (raised to 27 marks in 1655). The regimental barber got 30 marks in 1638, 15 marks in 1639, 27 marks in 1655 and 52.80 marks in 1685, while the pay of a Saxon *Feldscheerer* in 1613 was 33 marks monthly. During the Thirty Years War and after, the *Feldscheerer* did the duties of regimental surgeon, regimental barber and standard bearer combined<sup>12</sup>. The regimental barber had several apprentices under him, who assisted at operations along with the company barbers. Purmann, who was company and regimental barber in the armies of the Great Elector during 1667-1679, records that his regiment had 4 apprentices, the most liberal allotment in the whole army. As described by the writers of the time, the training of these apprentices was the poorest conceivable, consisting of little more than practice in curling wigs or trimming hair and beards. The Great Elector was, however, extremely solicitous about the transportation and care of the wounded. In an order of 1675, he censures his field-marshal, George, Prince of Anhalt Dessau, for neglecting this duty, and commands him to find places for receiving the wounded and to punish officials who did not comply with this obligation. After the battle of Fehrbellin (1675), he issued an order to the city commandant at Spandau (July 21) to provide three wagons for the wounded, with plenty of straw bedding inside, and with hoops fastened above and festooned with green bushes, to protect from the sun. Each of these wagons was commanded by a special officer. One of his marching orders, of date November 7, 1670, states that, for the transportation of the sick, as many conveyances as necessary or possible were to be commandeered, to be released successively as places were reached in which patients could be housed. An order of December 27, 1677, commands the magistrate of Stettin to provide not only quarters for the sick and wounded, but also medical care and attention. The Great Elector's hygienic ordinances for the construction of buildings against the pest, and for the sanitation of wells and streets (1644-60) are also progressive in spirit. On November 1, 1685, he instituted the Medical College of his Electorate.

### *Switzerland*<sup>13</sup>

In the 17th century, the military power of Switzerland sank to a low ebb, due to the constant internecine warfare over religious creeds and to the fact that the best of the manhood of the nation was employed elsewhere as mercenary soldiery. During the Thirty Years War, the Swiss were unable to maintain neutrality and protect their frontiers from invasion. Their largest mobilization was that for national defence when Louis XIV threatened Burgundy in 1668. The muster rolls of the different cantons throughout the century show that each company of infantry, artillery or cavalry had a field barber, and

<sup>11</sup> So named because attached to the cornet, a cavalry-formation, the standard-bearer of which had also the title and rank of "cornet."

<sup>12</sup> A. Köhler: *Arch. f. klin. Chir.*, Berl., 1911, CV, 781-784. Participation of army surgeons as combatants was common in the Swiss, Prussian and English armies in this period.

<sup>13</sup> Bräuner: *Die Verwundeten in den Kriegen der alten Eidgenossenschaft*. Tübingen, 1903, 192-229.



in the second half of the century, there were also regimental barbers for the larger formations. The three regimental barbers of Zürich (1682) were experienced surgeons, including the city physician and chief surgeon of the city hospital. In 1683, the General Staff of the Bernese Army had a field physician, field barber-surgeon and field apothecary. In the *Defensionale* of 1688 there is no mention of sanitary organizations for the large force then mobilized. The field physicians were provided with medicine chests. In 1687, Johann von Muralt of the Zürich forces drew up directions for packing one of these chests, which with the rules he gives for the treatment of gunshot wounds of different viscera, are far superior to anything else of the period. The pay of the field barbers was 10-12 kronen monthly. The instructions for field-barbers in the War Manual of Capt. Lavater (1657) are taken from Fronsperger. The city accounts of the different cantons (with *Feldschers*) for the care and treatment of the wounded show liberal expenditure of public moneys for this purpose. An extensive account of the city of Lucerne with the executioner Balthazar Mengis<sup>14</sup> suggests, in its details, that this functionary was also an expert bone-setter and wound surgeon.

### England<sup>15</sup>

In the reign of Queen Elizabeth, English forces were frequently employed in Ireland, and during these Irish wars, there was much hardship and depletion of personnel by disease, through lack of proper medical arrangements and officers. At this time there was "only one apothecary in all Ireland," and while Campion noted young medical aspirants "conning by rote the aphorisms of Hippocrates," physicians were few and far between. In consequence of the damp climate, the hard life in the bogs, poor food-supplies, and general bad management, epidemic dysentery, mortification of wounds, plague and other diseases did their work, and the royal forces were frequently so decimated that they were often at the mercy of their opponents. In the meantime, Irish soldiers were frequently employed by the English forces for service abroad. Through native brawn, length of limb, high spirits and unflinching courage, these Irish "kerns" and "gallowglasses" early demonstrated themselves to be remarkably efficient soldiery, and like the Swiss, were soon to be hired for this purpose all over Europe. Beyond an unprecedented raise in pay to £5 a week for the physician of the commander of the troops in Ireland (Lord Deputy Mountjoy), the disastrous results of these Irish campaigns excited little concern among the military authorities, probably by reason of the poor quality of medical personnel everywhere at this time. William Clowes, the satirist of English surgery in the period, writes in 1596:

"It is most truly said there is no coine so current but hath in it some counterfeites, which make it suspicious, so it is there is no profession so good but hath also come counterfeites, which breed in it disgrace; and none so much, I suppose, as there bee in some these daies, that take upon them the honest title and name of traveling surgeons. . . . Therefore friendly reader, let this be a warning unto thee, to take heed of these unclean birds, who do daily abuse many worthy persons, captaines, gentlemen, masters of ships and merchants of good account, by reason of their shameless braggings and boastings of their great, divine, magnificent skills in physick and surgerie, wherewith they say they are adorned and exceed all others, under color hereof, by their fraud and subtle means. . . . Truly many a brave soldier and mariner hath perished, and sometimes the Generall and Captaines themselves."

<sup>14</sup> Brunner: *op. cit.*, 212-214.

<sup>15</sup> A. A. Gore: *The Story of Our Services under the Crown*. London, 1879, 41-73. II A. L. Howell; J. Roy. Army Med. Corps, Lond., 1904, II, 606-737.

The Thirty Years War drew a great many English, Scotch and Irish soldiers into Germany, and although these expeditions were accompanied by medical officers, these too suffered great privations from cold and were frequently cut off in their prime through the ravages of epidemic disease. The pay of medical personnel at this time was about 6s. 8d. per diem for physicians and surgeons, 6d. daily for under surgeons and 3s. 4d. for apothecaries. The assignments were, as elsewhere, one surgeon for each troop of infantry, horse or artillery. The Cromwellian forces in Ireland had an apothecary general, but were otherwise but indifferently supplied with medical personnel, and there was still a great scarcity of native Irish physicians. Petitions of army surgeons that they be dispensed from transplantation to Ireland as colonists are on record. Wounded officers were sometimes carried on horse litters and sheltered in the castles of the nobility, but the lot of the sick and wounded soldier was undoubtedly hard. Sick and wounded Irish were frequently hidden in caves. Prior to this time, Charles I, to raise medical personnel for his French and Spanish expeditions, had, in 1626, authorized the Corporation of Surgeons of London to increase the pay of surgeon majors to 5s daily (about 25- present money) with a surgical chest worth £48, of surgeons to 2s.6d daily and of mates 1s. daily, with the customary stoppage of 2d. monthly from each soldier's pay for medicines, and a surgical chest worth £17 to each surgeon attending 250 men. The Corporation was also authorized to raise surgical personnel by impressment, and to appoint 10 examiners to ascertain the fitness of candidates for admission to the Corporation. The Bishop of London or Dean of St. Paul's, with this board were empowered to examine all practitioners in surgery, up to the Statute of 18 George II in 1745. Before this time the Corporation of Surgeons acted as Directors General of both army and navy. In spite of all this, and of the very liberal allotments of surgical chests, there continued to be great suffering among the troops during the Parliamentary Wars from the rigors of climate and the effects of communicable disease. The devastating epidemic at the siege of Reading (1643), as described by the clinician Thomas Willis (himself a private soldier at that time), was either typhus or typhoid fever, or perhaps a combination of both. A Parliamentary resolution passed on March 6, 1643, empowered the raising of parochial funds for the relief of disabled soldiers and the widows and fatherless children of slain persons (Gore). During the reign of Charles I, the army in Ireland had a physician general, the British East India Company had a surgeon general, and regimental surgeons and surgeons' mates were added to the medical personnel. The few physicians of any ability attached to armies came either from Oxford or the continental universities. Among these were the celebrated Richard Wiseman and William Harvey, both attached to the Royalist Armies, Dr. Edward Verney, the King's standard-bearer, who was killed at Edgehill; Dr. Wilson, the King's physician, who later shared his captivity at Hampton Court, Thomas Skinner, physician to Monk in his Scotch campaigns, and the anatomist Monro, attached to the Scots regiments. With the fall of the Commonwealth and the accession of Charles II (1660), the Parliamentary army was disbanded, and the Royalist forces were cut down to eventually four regiments and the Guards (1680), a force of about 5,000 men, with regimental, instead of company surgeons. During the occupation of Tangier by British forces (1664-84), the suffering and losses among the troops are described as immense and the services of the surgeons arduous. On October 27, 1679, a Royal Hospital for aged and disabled soldiers was established at Kilmainham, near Dublin. A private retreat for the same purpose had been established at Hereford by Sir Thomas Coningsby in 1614. Chelsea was founded in 1663 and Greenwich (for seamen) in 1695.

Upon the accession of James II (1685), new regiments were added to the Regular Army, necessitating an addition of 11 surgeons and 11 surgeons' mates, and a regulation was issued granting a pension of one year's pay from the "King's Bounty," for loss of an eye

or limb, upon certificate of the chief medical officer of the army, now called "surgeon general." At this time it was customary for medical officers to hold double commissions, receiving pay both as combatants (ensigns) and for hospital duties. The pay list of 1686 gives a surgeon 6s. 6d. per diem and an ensign 3s. per diem. The medical officer wore the bright scarlet uniform of his regiment. After the Revolution of 1688 and the accession of William III, nine regiments, with medical officers were added to the army. The siege of Londonderry and other features of the Irish campaign again occasioned great suffering from disease. Some 24 French surgeons were added to the forces in Ireland in 1690. Of this army Dr. Patrick Archibald was "Chirurgion General" and Sir. Patrick Dun, Physician General (1688) at 10s. a day. The latter was succeeded in 1713 by Sir Thomas Molyneux. The depredations of the armies of Louis XIV in the Palatinate led to the Grand Alliance of 1689, in which English forces participated until the peace of Ryswick (1697), after which the British Army was cut down to 7,000 men, with a corresponding reduction in medical personnel.

### *Russia*<sup>16</sup>

The development of the Scandinavian Russian civilization was terribly impeded by the Mongol invasions and Russian medicine owes its origins to the Romanoff dynasty (1613-45), under whom a Ministry of Medical Affairs (*Aptekarski Prikaz*) was founded in 1620. Prior to this event, many English and other foreign physicians had been invited to settle in Russia by Ivan III and Ivan IV (1468-1584). This Ministry, the starting point of the patriarchal organization of medicine in Russia, had for its origins sundry drug-stores or medical supply stations for the dispensation of medicines. Its president was regarded as the highest official in the Empire, and its membership included the body-physician of the Czar. In 1615, a physician attached to the army, is mentioned in the archives, and again, in 1631, when the forces were increased, both subordinated to the Medical Ministry. Prior to this time, sums of money were set aside to pay barber-surgeons for the care of the sick and wounded in campaign. In the second half of the 17th century, regimental field dispensaries were instituted, with funds of 200 rubles per annum. These developments were materially forwarded by Peter the Great (1690-1725) under whom the Ministry of Medical Affairs became a Chancellery in 1707. A ukase of 1716 assigned to each division of the army a physician, a staff-barber and two apothecaries, a surgeon to each regiment, and a field-barber to each company; at the same time, field hospitals were instituted.

### *Military Surgery in the 17th Century*<sup>17</sup>

Frederick the Great relates in his Memoirs that in the armies of the Great Elector, one-third of a battalion were armed with pikes, two-thirds with muskets, and that not before 1700 were the entire infantry provided with firearms. Canister (caseshot) and bomb-shells were employed in the artillery, the latter usually as hand-grenades. The iron ramrod, introduced by the Prince of Anhalt-Dessau (*circa* 1698-1718) enabled the infantry to load and fire with greater rapidity. At first, the round lead bullets seldom underwent deformation by reason of the slight propelling power of the charge, and in consequence, as

<sup>16</sup> Knorr: *op. cit.*, 381-392.

<sup>17</sup> For further data on the subject, see Kochler: *Veröffentl. u. d. Geb. d. Mil.-San.-Wesens*, Berl., Heft. 13, 1899, 41-50.

Wolzendorff: *Deutsche med. Wochenschr.*, Leipz. & Berl., 1892, XVIII, 550-553.

becoming rapidly encysted in the blind canals created, were frequently allowed to remain within the body until a favorable opportunity or an actual necessity for removal. But with greater propulsive power in the weapons, there was eventually deformation of the projectile with laceration and mangling of the tissues, which was even more pronounced in the case of bullets of stone, iron, copper, glass or slag. Such wounds were almost invariably the seat of suppuration, all the more exaggerated through the practice of widening the wound by the surgeon's fingers or instruments to remove the bullet, and the then common practice of primary débridement. All the surgeons of the century were keen for prompt removal of the bullet, and Paré's teaching having obliterated the notion that gunshot wounds could be poisoned, surgeons were only too ready to explore open wounds with dirty fingers. The whole matter remained a ghastly chapter until cleared up by the teaching of Lister and La Garde. In the 17th century, gunshot wounds were dressed with strange salves, compounded of nauseating ingredients, boiled with turpentine or camphor, happily disinfected by the heat in the first instance. If, in spite of this, there was septic fever, blood-letting was instituted at once. The almost universal stuffing of wounds with charpie was a frequent cause of infection and hospital gangrene. Such superstitions as the weapon salve, the sympathetic powder, and the "transplantation cure" (dipping a bit of wood in the blood or pus of the wound and pegging it into a tree) were at once phases of the curious doctrine of "action at a distance" and a vague groping toward the rational plan of leaving the wound to heal of itself. If the sliver of wound grew into the tree, the wound would heal over. These superstitions, while ridiculed by Purmann, Fabricius, Wiltz and the other surgeons, did not die out until the middle of the 18th century, and were even recommended to Frederick William I of Prussia (during an attack of gout) by two of his generals, in 1737.

The 17th century was the great period of amputating limbs, which was done with reckless profusion by the half-instructed surgeons of the time, until the stand taken by Frederick the Great and the strong protest of Bilguer in 1768 put a stop to the fashion. Wholesale lopping off of limbs oftentimes resulted in the speedy death of the patient from shock and hemorrhage and filled the streets of the cities with mendicant cripples, whose grotesque yet wretched status has been forcibly commemorated in art by Bosch, Brueghel and Callot. The principal indications for amputation were cold, dry and moist gangrene, but unfortunately the apprentices resorted to any excuse for practising on their patients to bolster up their own conceit. Fabry of Hilden, in his treatise on gangrene (1593), was the first to recommend amputation

above the diseased part, and improvised a rude tourniquet to shut off the circulation, consisting of a ligature tightened by a stick of wood. The cauterization was still used to check hemorrhage and pain was sometimes annulled by the old mediæval device of allowing the patient to breathe a sponge steeped in a mixture of opium, hyoseyamus and belladonna. It is said that Würtz taught the immediate closure of chest wounds before Larrey, but, as this doctrine was opposed by Fabry, such wounds were treated by widening, drainage, injections and paracentesis of pus. Gunshot wounds of the abdomen were sometimes drained, but in spite of the current belief in "laudable pus," the general practice of drainage in wound-treatment was not standardized until the advent of John Bell. Gunshot wounds of the urethra were noticed by Purmann, Hutter and Scultetus.

The leading English exponent of military surgery was Richard Wiseman (1622-76), who served with the Royalist forces, and summed up his extensive experiences in his treatise of 1672, containing many case histories. He employed primary amputation in gunshot wounds of the joints, first described scrofula (King's Evil) and tuberculosis of the joints (tumor albus), and in his treatise on gonorrhœa, mentions the first case of external urethrotomy for stricture, which he performed with Edward Molins in 1652. The first case of flap amputation is recorded by James Yonge (1679). In Matthæus Gottfried Purmann (1649-71),<sup>18</sup> who served in the Brandenburg Army for nine years (1671-79), the Great Elector had, attached to his service, the best German surgeon of the time. He was a bold, resourceful operator, even invading the brain and the clavicle for bullets, and his fifty cases of gunshot wounds (1693) and eighty curious observations (1710) include bronchotomy, suturing of the intestines, trephining (40 cases), lithotomy, eye surgery and orthopedics. His experiences covered the battles of Fehrbellin and Rathenow and all the sieges of Pomeranian towns. He complains bitterly of the difficult extraction of splinters from wounds made by glass hand grenades. Wilhelm Fabry of Hilden (1560-1624) the father of German surgery, wrote important treatises on gangrene (1593) and lithotomy (1626) and left another admirable set of 100 case histories (1606-46). He reasoned that head injuries may cause insanity, extracted iron splinters from the eye with a magnet, devised an aural speculum and the first field chest of drugs, based upon the model proposed by Moritz of Nassau (1612). Johann Schultes (1595-1645), called Scultetus, published in 1653 an atlas of surgical operations and instruments, which, with the later treatise of Heister (1718) is our principal source-book for the graphics of operative procedure in the time.

In France, Nicolas de Blegny (1652-1722) invented the elastic truss (1676) and Morel introduced the tourniquet (1674), which was successfully applied in ligating the femoral artery at the Hôtel Dieu in 1688, and Jacques de Beaulieu (1651-1719) or Frère Jacques, a strolling incisor, introduced the lateral operation for stone (1697).

In Italy, Cesare Magati (1579-1647) taught the treatment of gunshot wounds with bandages soaked in plain water and Giuseppe Zambeccari was a remarkable pioneer in experimental surgery of the viscera for this purpose. Pietro de Marchetti (1589-1673) left one of the best repositories of medical and surgical cases (1664). The surgical knowledge of the earlier period is summed up in the gigantic *Thesaurus* of Peter Uffenbach (1610).

<sup>18</sup> For a full account of Purmann, including his autobiography, see Köhler: *Veröffentl. d. Geb. d. Mil.-San.-Wesens*, Berlin, 1899, 13 Heft. 86-114.

*Epidemic Diseases*

Throughout the whole of the 17th century, the European peoples were harassed by almost continuous wars or the natural sequels of lengthy wars, viz., devastating disease and starvation. During the Thirty Years War, the opposing armies marched and counter-marched all over central Europe and wherever they went, wherever they were camped or billeted, they were at once victims and carriers of bubonic plague, camp dysentery, syphilis, typhus and typhoid fevers, while, through their reckless destruction of material supplies and the impossibility of continuous sowing and harvesting, famine always went in their train. The story of these miseries, too lengthy to be repeated here, has been told in all its ghastly details by Gottfried Lammert (1890)<sup>12</sup> and Englished by Prinzing (1916).<sup>13</sup> By the end of the Thirty Years War, Germany was a ruined, desolate country, its population reduced from 16-17 millions to 4 millions (Lammert).<sup>14</sup> According to the *Ercidium Germaniae*, "one could wander ten miles without seeing a soul, scarce a cow." By the 17th century, leprosy had been almost completely stamped out, and the lazaret-houses were abolished, but bubonic plague was rampant everywhere, with a mortality of 127,000 in Moscow (1601-03), 80,000 in Milan (1630), 69,000 in Great Plague of London (1665), 70,000 at Vienna (1679), 83,000 at Prague (1680), and over 500,000 in the Venetian Republic. Next to the plague, typhus fever (Hungarian disease) was most fatal in its incidence. Hungary was called "the German's graveyard." Influenza and ergotism were common. Small pox was pandemic in 1614 and epidemic in England in 1666-75, eventually reaching North America, where yellow fever was already endemic. Scarlatina, described by Doering (1625-08) and Sennert (1628), was first clearly differentiated from measles by Sydenham (1676). Infantile mortality was exceptionally high in this period.

*Account of Pediculosis in Army Camps by Tobias Cober (1606)*<sup>15</sup>

In 1606, Tobias Cober, a physician of Görlitz (Bohemia) who had seen seven years military service in the "Long War" between the Hungarians and the Turks, published three series of "Medical Observations in Hungarian Camps," in which he gives a lengthy account of the prodromes and symptoms of camp typhus, then known variously as *morbus hungaricus*, *lues pannonica*, *languor pannonica*, etc. In noting the effects of mental excitement and fatigue in predisposing to the disease, he refers particularly to the mental irritation produced by the swarms of mosquitoes, gnats and lice that infested the camps. The following extract is perhaps the first account of pediculosis in camp:

With these foregather the most terrible pediculi, hardly to be thought of without a sense of discomfort, which in themselves, through their constant promenading and sucking of the body, are enough to stir up one's bile. For it is impossible to avoid the bites of these miserable creatures, especially in the first years in the field, as they enjoy a sort of right of citizenship in all camps. The atmosphere is so lukewarm, mild and stuffy that when

<sup>12</sup> G. Lammert: *Geschichte der Seuchen, Hungers und Kriegsnot zur Zeit des Dreissigjährigen Krieges*. Wiesbaden, 1890.

<sup>13</sup> F. Prinzing: *Epidemics resulting from Wars*, Oxford, 1916, 25-79.

<sup>14</sup> Prinzing (p. 77) regards this as exaggerated, as other estimates claim that Germany lost one-half its population. Saxony lost 931,000 in 1631-2 alone. The population of Bohemia is said to have decreased from three millions to 780,000, and Württemberg from 414,800 to 97,300.

<sup>15</sup> T. Cober: *Observationum medicarum castrorum Hungaricum decembris tres*. Helmstädt, 1605, 19-51.

clothes which have been washed in swamp water are exposed to the sunlight, they are seen to swarm with these "vermibus Syllanis." One cannot hope therefore to get away from these constant attendants and companions, as they seem to arise from the very moisture of the body itself. At first I thought to rid myself of the pest by constant change of newly washed clothing, but even this seemed to bring them more and more into play, instead of destroying them. And this phthiriasis, which even the Egyptian magi of old could not produce, but which in these localities every one can create in his own person, can, as I bear witness, drive a man into fury. For as often as I was bitten by these miserable, abject animalcules, I gave full rein to my anger, fairly gnashing my teeth with rage, and cannot even now think of them without vexation. . . . One cannot ward off these armed six-footed Turks even with iron and steel. . . . And among many soldiers I have noted the frightful spectacle that this fearful plague of lice had gone far enough to cover the whole nape with ulcers, the flesh not only excoriated to the breadth of one or two fingers, but actually excavated, the men condemned to this miserable fate dying with groans and lamentations.

### *A Camp Hospital Regulation of the 17th Century*<sup>23</sup>

The armies of the *Landesknechte* had occasionally a few tents (*Krankenzelte*) set up for the sick and wounded in camp, but the first definitely organized military hospitals in Germany were those authorized by Elector Maximilian of Bavaria in 1620 for the armies of the Catholic League. One of these was an interim hospital or casualty clearing station in the field, the other a permanent main hospital in the nearest town. None of these earlier camp hospitals were mobile field hospitals of recent type; the term "field-hospital" is applied to them by courtesy. In June, 1685, following the bloody battle of Fran between the Imperial forces and the Turks, the Brunswick troops acquired field or camp hospitals, and a set of regulations for these was drawn up by Konrad Barthold Behrens (1660-1736) and published in 1689.<sup>24</sup> These hospitals were massive, many-storied buildings, run up in the vicinity of the camp, on good sites in the neighborhood of wood and water. Dysenteric or other patients were segregated in well ventilated rooms, according to diseases; yet while strict cleanliness is enjoined in the regulations, hospitals were not popular with the sick, and the caution against the passage of faeces and urine through cracks and knotholes into rooms below, points to jerry-building and the squador of the time. The personnel consisted of the physicians, whom the patients were allowed to choose, the field-barbers, apothecaries and attendants, usually priests, captains and female camp followers, the whole supervised by an officer with soldiers. The duties of the physicians were to detect malingering and to prescribe diet and medicines for the sick, but with 800 sick soldiers daily in 1685, only a word could be devoted to each patient, and the order had to be carried out by the barbers, the medicines being subsequently prepared by the apothecaries in the presence of the physicians. The apothecaries were required to keep a full supply of medicines on hand, making timely requisitions where necessary, and relying mainly upon vegetable simples, for economic reason. Candles, salt, sugar, olive oil, nutmegs, oatmeal, rice, red wine, brandy, juniper berries and vinegar were regarded as the main staples. The patients lay upon linen sacks filled with straw and a plentiful supply of linen for bandages is specified. To each hospital was attached a *commisarius* or finance officer, who provided funds and regulated the accounts. A picture of the interior of a military hospital of the period forms the frontispiece of Andreas Hütter's *Fifty Surgical*

<sup>23</sup> W. Haberling: *Arch. f. Gesch. d. Naturwissensch. u. Technik*, 1918, VI, 150-159.

<sup>24</sup> K. B. Behrens: *Consilium oder rätthliches Gutachten wie ein Soldat im Felle für Kranckheiten sich hüten und denselben zur Noth begegnen könne*, Hildesheim, 1689. For the text of the regulations, see Haberling: *op. cit.*, 156-169.

Observations (1718).<sup>25</sup> It represents a large commodious ward, opening by an arched doorway upon the distant camp, through which the wounded are brought in on litters, while the surgeon and his apprentice, in *justaucorps* coats hover about the beds. The furniture (beds, table, chairs) is of the heavy, ornate, household type, and was probably obtained from neighboring houses.

### *Attempts at Regulation of Prostitution in Armies*<sup>26</sup>

Never were mobilized armies so beset and hampered by hordes of camp followers as during the Thirty Years War. Schiller states that at the siege of Nuremberg (1632), there were 15,000 loose women in Wallenstein's camp alone and Wallhausen (*Defensio patriae*) counted 4,000 women and their offspring attached to a single regiment of 3,000 Germany infantry, the 300 wagons of the train being loaded down with these camp-followers and their plunder. In 1648, at the end of the war, General Gronsfeld reported to Elector Max of Bavaria that the Imperial and Bavarian armies consisted of 40,000 soldiers, who drew rations, and 140,000 prostitutes and camp-followers, who drew none. In 1650, the four Swedish companies that revolted at Köthen numbered 690 soldiers, 650 women and 900 illegitimate children. This condition, an essential feature of the then current concept of the regiment as the "home of the soldier," persisted *diminuendo* until the end of the 18th century. In the earlier period, these kept women, plying their various avocations as laundress, sempstress, cook, sick-nurse, midwife, bar-maid and concubine, had the strongest hold upon the soldier, and the various devices resorted to by commanders to get rid of them were speedily outwitted by the troops themselves, in spite of innumerable orders and regulations everywhere. The first plan hit upon, explicitly stated in the Articles of War of Maximilian II (1570) and repeated in the cavalry regulations (*Reiterrecht*) of Wallenstein (1617) and those of Gustavus Adolphus (1621) and the Great Elector (1656), was to forbid any women in camp, unless duly wedded soldiers' wives. But this only resulted in countless "drum-head marriages," often with women of the lowest character (Wallhausen records as many as 800 marriages in two days). Attempts to leave the horde (*Weibertross*) stranded in crossing a stream were always circumvented by the humorous protests of the soldiery, who declined to march farther. Regulations, such as those of Ferdinand III of Hungary (1643-1645), authorized the driving away of women with whips and by heavy fines for the soldiers, but are said to have only increased the number in the long run, due to the general starvation of the people, and the fact that an adventurous

<sup>25</sup> For reproduction of which see Wolzendorff: *Deutsche med. Wochenschr.*, 1892, XVIII, 553.

<sup>26</sup> W. Haberling: *Das Dirnenwesen*, etc. *Ztschr. f. Bekämpf. d. Geschlechtskr.*, Leipz., 1914, XV, 312-326.



camp life permitted a livelihood by theft and plunder. Military orders, too numerous to mention here, went the length of severity, but such barbarous devices as cutting off ears and noses or that of *passer par les verges*, were unavailing, until troops were quartered in closed barracks. The wretched offspring of soldiers' mock marriages were doomed to fill the brothels and thieves' kitchens. Almost nothing is said of syphilitic infection in the military regulations of the time, although Fronsperger, in his Navy Regulations, had mentioned it as a reason for not permitting women on board ship. In his "Discourse on the present German Army," Count John of Nassau-Siegen, one of the leaders in the Protestant Union (1608),<sup>27</sup> filed a vigorous protest against the *Weibertross*, proposing that they be excluded rigorously from camp, "to prolong the soldiers' lives and to protect the camp from contagious diseases." This is again repeated in the Spanish Articles of War of 1681 and in the ninth article of an edict of the Magistrate of Strassburg (1684), in aid of protecting the troops quartered there "from infection." It was not before the middle of the 18th century (1750), that orders began to appear authorizing medical treatment of diseased camp-followers prior to imprisonment. Success in suppressing vice and disease in armies varies inversely with the number of troops mobilized. In the 17th century, it was not possible, even with the smallest detachments.

### *The Exhortations of Gehema*

Across the four centuries comes a voice raised to denounce the indifferent care of the sick and wounded soldier by the half-baked medical personnel of the period, a voice crying in the wilderness. It is that of Janus Abraham à Gehema (1647-1715),<sup>28</sup> a Polish knight and master of horse, who, orphaned in childhood, trailed a pike in the Low Countries, studied medicine at Groningen, Leyden and Utrecht, and like most rolling stones of the time,<sup>29</sup> served in nearly all the wars of the period in various capacities, to settle down finally in Berlin as court physician and upper-herald to Frederick I of Prussia. In his roving life, he seems to have married five (some say seven) wives in succession and to have turned out, along with a large family of children, some thirty books bearing such queer titles as "Gout Conquered by a Chinese Weapon, the Moxa" (1683), "The Best Way to Kill Time" (1686), "The Noble Drink, Tea" (1686), "The Conscientious Wet-Nurse" (1698), "Two and Twenty Fever Cures" (1702), etc. His fame rests

<sup>27</sup> W. Haberling: op. cit., 173-174. The text is said to be in the Dillenburger Archiv at Wiesbaden, K. 938.

<sup>28</sup> For the life of Gehema, see Köhler: Veröffentl. a. d. Geb. d. Med. San.-Wesens, Berl., 13. Heft, 1899, 52-85.

<sup>29</sup> Another roving character of this order is described by A. Köhler in Berl. klin. Wochenschr., 1913, LV, 1083.

securely upon three books which are now highly prized and esteemed, namely, "The Well-Experienced Field-Physician" (1684)<sup>30</sup>, "The Officer's Well-Arranged Medicine Chest" (1688),<sup>31</sup> and "The Sick Soldier" (1690).<sup>32</sup> In these, Gehema appears as a notable exhorter and hot gospeller for the soldier's welfare; garrulous at times, like Paré or Paracelsus, but with the same native fire in his soul that is apparent in the great medical reformers of the Renaissance.

The burthen and plaint of his argument is that through the divorce between medicine and surgery, hundreds of soldiers had to die because they were attended in illness, not by the field-physician, but by ignorant barbers, and then usually not even by the regimental barber, but only his apprentices, who were as little fitted for the surgical calling as "a jackass at a dance"; furthermore it was hopeless to attempt to keep a field army of 20,000-30,000 men in good condition with but one physician at best to look after them and with field-chests filled with idiotic remedies. These chests, Gehema maintained, should be furnished not out of the physician's pocket but by his government. The pictures given by historians of the low status of medicine in the 17th century are usually taken from Gehema, whose books afford the most vivid sidelights on the military medicine of the times. "Can there be," he cries, "any more miserable creature under the sun than an unfortunate soldier? O ye officers! think that such an one is not made of wood or stone, but is a man and exposed to the same chances as yourselves. . . . Few indeed have I seen who took enough pity on the sick soldier to visit his bedside, give him some attention and send him food, which would cost very little."

To Gehema's protestations, however, the 17th century authorities were as indifferent as the pest-doctor of the time, who saw his patients behind a pane of glass, while his apprentices attended them. Speaking of the lengthy literary productions of the period, James Russell Lowell observed, with the exaggeration of American humor, "We wonder at the length of face and general atrabilious look of the men of that generation, but it is no marvel when even their relaxations were such downright hard work." The gloomy sepulchral spirit of the 17th century is expressed in the lines of one of its poets:

"Devouring Famine, Plague and War,  
Each able to undo mankind,  
Death's servile emissaries are"

and this mortuary feeling, if nowise apparent in Spinoza or Molière or Rubens, is to some extent perceptible in Milton, in Bach, in Bunyan and Sir Thomas Browne. It was not without reason that Mazarin inquired concerning any commander recommended to him, if he possessed the cheerful, fortunate disposition necessary to the successful conduct of military operations—*Est-il heureux?*

<sup>30</sup> Wohlversehener Feld-Medicus, Hamburg, 1684.

<sup>31</sup> Wohleingerichtete Feld-Apotheke, Bremen, 1688.

<sup>32</sup> Der kranke Soldat. Stettin, 1690.

(To be continued)

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## EDITORIAL

### THE SERVICE PAY BILL

In the present unsettled condition of legislation affecting the Federal services, the pay status is as much a problem as any other factor dealing with the successful maintenance of these forces. In regarding the so-called "Service Pay Bill," the McKenzie-Wadsworth Bill, it is quite proper to face squarely one fact; namely, that no bill on any subject can be drawn which will meet with the approval of everyone. There are bound to be "many men of many minds." What seems desirable to one individual may appear rank discrimination to one who has a different slant.

It is very probably true that many officers who object to the McKenzie-Wadsworth bill do so either on hearsay evidence or as a matter of general objection without having read the bill or giving it close thought and study. One thing is quite certain; namely, that Congress will not pay very patient attention to a multiplicity of bills dealing with the same subject. If we of the Federal services do not know what we think best for us as a whole, it is wholly probable that the gentlemen on the hill will fall back on the basic ground of general economy which is the present key-note—and exercise a very trenchant ax, which will leave us all much worse off than we might be by the passage of the bill in question.

This proposed measure was drawn up by a committee of the various Federal services, serving in committee, and the provisions which it contains were adjusted according to the approval of the representatives of the different services involved. A reversion to the 1908 status, which

is not a remote possibility, would mean a distinct loss to everyone concerned. It is frankly admitted by everyone that Congress does not intend to continue the "bonus" which was in effect for a certain length of time. That being the case, why not, for the time at least, accept and advocate what is not an unjust measure, according to the views of the committee members of the various services which were concerned in the drawing of it, instead of offering merely destructive criticism; picking to pieces the proposed measure without offering any better and more logical substitute?

The best analysis of the bill is that which was published by the U. S. Infantry Association. The *Army and Navy Journal* of March 11 also reviews it thoughtfully.

In framing this bill the War Department agreed to the following principles:

1. That length of service should be a controlling factor in determining rates of pay.
2. That there should be an element in the compensation of an officer which would increase or decrease the total compensation as the cost of living increased or decreased.
3. That the conditions under which an officer lived are so dissimilar to those existing in civil life that some extra compensation should be allowed to enable him to care for his family under these circumstances.
4. That a junior officer required somewhat less in the matter of living conditions than older officers.

*Compensation of Officers.*—The total compensation of officers is made up of two parts: One, pay proper with longevity; and the other, subsistence and rental allowances which will fluctuate from year to year as subsistence and rental cost fluctuate. The pay proper was built upon the base pay as established in the 1908 pay schedule, except that that of a second lieutenant was reduced from \$1700 to \$1500, and the longevity was changed from the existing 10 per cent increase for every five years service, with its limitations, to a 5 per cent increase for each three years' service up to and including thirty years of service. For the purpose of computing pay all service which has heretofore been counted for that purpose was continued as counting with the proviso that officers who hereafter enter the service could count for pay purposes, commissioned service only. This question of service for pay was one of the hardest the Service Committee had to solve. The committee realized that it was necessary to give credit for commissioned service only or to recognize in their entirety the rights in this respect that already had the sanction of law. It frankly admits the impossibility of doing exact justice to every individual and believes that its decision to recognize in this respect those rights which had the sanction of law as obligations that should not be repudiated, operates to the advantage of the greatest number. This action takes nothing from any individual but only continues those things which existing law authorizes for those now in the service. Hereafter only commissioned service will count.

In order to make length of service a controlling factor in determining the pay of officers and at the same time to recognize grade as an essential feature, it was decided to recommend a sliding scale in regard to pay which would protect the interests of the Government in case of abnormally rapid promotion in any particular service, and which would protect the interests of the individual in case of any abnormally slow promotion. The effect of this sliding scale is to give to an officer of any particular grade the pay and allow-

ances of the next higher period when promotion is abnormally slow. The contrary effect is obtained by providing that an officer should continue to receive the pay and allowances of his old period when promotion is abnormally rapid.

*Saving Clauses for Officers and Enlisted Men.*—In building up the pay schedule an effort was made to provide a schedule which would meet as nearly as possible, the needs of the future when the flow of promotion was normal. Because of the abnormal situation in regard to promotion that exists in the Army at this time, such a schedule would not fit present conditions without taking from some groups of officers rights they have already acquired. To meet this situation a saving clause was written into the law which will operate to protect officers now in the service in these acquired rights. This saving clause will protect all officers now in the service against any reduction in pay below that provided in the 1908 pay schedule. In figuring out pay according to grade and pay period all officers should continually keep in mind this saving clause, and should remember that it applies to pay only and not to allowances. In other words, each officer is entitled to the allowances provided by this bill and to the pay provided in the Act of 1908 or this Act, depending upon which is more favorable for him.

The saving clause for enlisted men protects them against any reduction in pay during their current enlistment and while holding their present grades.

*What the Bill Does.*—(1) It gives to each officer not less than he would receive under the 1908 schedule and in addition thereto certain allowances, so that every officer in the active service receives some increase over the 1908 pay. The operation of the bill is to give to those officers in the lower portion of each period somewhat more than the 1908 basis, those in the upper portion something near the 1920 basis (which includes the temporary increase) and those in the middle portion something between these extremes. In some few cases it gives a greater compensation than that provided in the 1920 basis.

(2) It recognizes the family life as a normal one and provides for it accordingly.

(3) It protects the individual against the blight of slow promotion, which is something new in pay legislation.

(4) It offers a reasonably attractive career for young men of a desirable kind, by giving a progressively increasing pay which will allow those that give long service to retire with a more reasonable compensation.

The question for each individual or each individual group of officers in any particular service to decide at this time is not whether the bill exactly suits their needs or wishes, but whether they want any pay legislation at all.

Clearly a united support of the proposed bill may result in its passage and clearly, also, concerted opposition to the bill or attempts to amend it by any particular group may have for its effect a defeat of the entire measure, and a return to the 1908 basis.

Realizing the consequences of efforts to amend the bill by those who can not know all the conditions in all the six government services involved or all the conditions in the various groups of any one service, individuals are asked to look upon it in the same spirit that the subject was approached by the Service representatives.

It might as well be realized now that the success of the measure is dependent upon united support and that the probable result of opposition will be a return to the 1908 pay.

So far as the retired list is concerned, this piece of legislation is quite as inadequate as any which has been passed. It is still presupposed that the retired officer in some miraculous manner can get on quite comfortably without the three quarters of the allowances which are so essential to his brother on the active list. He is further hit in the

matter of service for promotion, but then the retired list has fallen into the category of old clothes, and claim for faithful service previously performed will probably never have the same interest or attention as the claims of those who are "in medias res." Nevertheless, the Retired Officers' Association has, with a rather fine spirit, set the seal of its sanction on this measure which, while not benefiting them to any great extent, does do something for those who are still part of the combat force.

JAMES ROBB CHURCH.



## COMMENT AND CRITICISM

### REMARKS ON TONSILLITIS OCCURRING IN MEN OF THE REGULAR ARMY

Investigation pertaining to the prevalence of tonsillitis in the Regular Army reveals the following interesting data: In 1920 the ratio per thousand of days lost by tonsillitis in the regular forces was 1.72. This places tonsillitis as one of the leading diseases in days lost, while for admission, tonsillitis, with a ratio of 77.68, ranks first.

Bad tonsils often involve periods of slight inflammatory exacerbations every few weeks, often accompanied by rheumatic pains in the limbs, followed by marked depression of vitality and a definite proneness to succumb to various forms of infection.

Upon a complete removal of the tonsils, a permanent relief from all symptoms usually results, thus keeping the soldier on the effective list, where heretofore his appearance at sick call for minor ailments was of frequent occurrence.

That septic tonsils are foci of infection in heart, stomach and arthritis cases is well known. Might they not also be a source of infection in influenza and other respiratory diseases? While tonsils harbor disease germs, it is known that tonsillitis is not a transmissible disease *per se* from man to man.

If E. N. T. Operating Teams could be sent throughout the various corps areas to the smaller stations to perform tonsilleotomies on many of these cases, it is thought that a considerable number of men who have become "chronic ineffectives" through tonsil complaints would be returned to a permanent duty status instead of a transitory one as at present.

VIRGIL BLACKSTONE WILLIAMS,  
*Captain, Medical Corps, U. S. A.,*  
*Surgeon, Raritan Arsenal, N. J.*

### THE ST. LOUIS MEETING OF THE AMERICAN MEDICAL ASSOCIATION

The arrangements of the St. Louis profession for the meeting places for the Session of the A. M. A., which is to be held in their city, May 22-26 next, are singularly fortunate and convenient; never has the Association been so well favored in this respect. The district in which the meeting is to take place is at the west edge of the business section of the city, easily accessible from all directions by street car or otherwise and not more than fifteen minutes street car ride from the most distant

hotel. The grouping of the meeting places is so compact that should one walk from the Registration Building (Moolah Temple) to the farthest hall it can be done in ten minutes or less; from section to section is a matter of from one to five minutes. The convenience of the location and arrangements of the different halls is more outstanding than in any other city in which the association has met, and a decided improvement over the accommodations which were had at the meeting in St. Louis, 1910.

The Registration Office, Post Office and Commercial Exhibit is to be in the Moolah Temple (Shrine), a beautiful and commodious building on Lindell Boulevard, two blocks west of Grand Avenue. At the other extremity of the group is the Odeon, the home of the St. Louis Symphony Orchestra, with a main hall which seats better than 2,000, and several lesser halls. The main hall will be used for the opening session. Its acoustics are particularly good and suited to our purpose. The Sections on Practice of Medicine and of Diseases of Children meet here. In the assembly hall of the same building the Sections on Pharmacology and Therapeutics and on Pathology and Physiology will meet. (It will be noted that there has been an aim to foregather closely allied sections.) The Sheldon Memorial, a very beautiful new hall on Washington Avenue one-half block west of Grand Avenue, which most admirably meets all requirements, will be the meeting place of the Sections on Ophthalmology, and Laryngology, Otology and Rhinology. The Section on Surgery, General and Abdominal, and on Obstetrics, Gynecology and Abdominal Surgery, will be held in the Third Baptist Church on Grand Avenue, a situation well suited to the demands. The Sections on Orthopedics and Nervous and Mental Diseases will meet in the Law School of the St. Louis University, on Lindell Avenue, a few steps west of Grand. The hall easily seats 500 and is both comfortable and convenient. Dermatology and Syphilis and Urology will use the large Union Methodist Church, on Delmar Avenue just west of Grand, which meets every requirement. The Sections on Gastro-Enterology, Proctology and on Preventive Medicine will use the large hall in the Musicians Club on Pine Street, east of Grand Avenue, and next to the building of the St. Louis Medical Society, where the House of Delegates will hold its sessions. The Section on Stomatology is assigned to the assembly hall of St. Peters Parish House, one block west of Grand on Lindell. Immediately in this district will be found three of St. Louis's most important clubs, the St. Louis University, and the Columbian. Restaurants catering to every grade of patronage are numerous in the district, and precautions have been taken to insure that normal rates continue during the meeting.



The St. Louis profession is preparing for an unusual attendance; hotel reservations are coming in rapidly, but it is purposed that even the late comer shall be comfortably housed. The wise traveler, however, makes his reservation as early as he finds it possible. Dr. M. B. Clopton, 3525 Pine St., St. Louis, is chairman of the Committee on Sections and Section Work.

### A COMPLICATED CASE

Being related to 4 per cent of the total population of the old home town is a claim that few people, throughout the length and breadth of America, can legitimately make, but, upon investigation, it has been authentically learned that the late Bennie F. Taylor, of Crystal Springs, Mississippi, came of a family, which, exclusive of cousins, stands in this ratio to the 1,395 residents of Crystal Springs.

Taylor's case is decidedly unique. He was soldier at Camp Beauregard, Mississippi, and died in 1918, naming in his government term insurance policy as the beneficiary, his father, who, in turn, died, leaving the insurance to the next of kin. The United States Veterans' Bureau requested from the family a list of those relatives falling within the "permitted class," and this is what resulted:

The bureau received a list, five feet long—the longest ever filed since the creation of the Bureau—containing the names, ages, and addresses of 9 brothers, 6 sisters, 6 uncles, 6 aunts, 23 nephews, 19 nieces, 6 brothers-in-law, 8 sisters-in-law, and a stepmother. Of this total of 84 living relatives, exclusive of cousins, 38 bear the name of Taylor; the remaining 46 include the names of Berch, Campbell, Summers, Davis, Goss, Broadwater, Lemon, Bornes, Ponder, Thornton, and Manning.

After an intimate survey of the "five-foot family tree," it was discovered that 50 of the surviving family are now residents of Crystal Springs—a number that in itself is a trifle more than 4 per cent of the entire population of the town, which according to the most recent census is 1,395.

The oldest of the relatives named is an uncle of 70, and the youngest is a nephew born in January, 1922.

All the 84 enumerated as being within the permitted class live within the boundaries of the State of Mississippi and are about equally divided as to sex. In actual figures the male members total 44; those of the opposite sex number 40.

The same Christian names are seldom to be found twice. Not that they are odd and unusual, for such is not the case; they are all strong

popular American names, and on the whole are extremely short. None is over twelve letters in length.

During the father's survival of the death of Bennie Taylor, the Veterans' Bureau forwarded him monthly checks of \$28.75 each, and at his passing 204 installments of like amount on the son's \$5,000 term policy, remained unpaid. Since the father died without leaving a will, a new adjustment was required to establish the beneficiary rights.

Action upon the case, by the Veterans' Bureau, has been based upon the Mississippi inheritance law, and final settlement will result in paying the stepmother and 15 brothers and sisters monthly installments of \$1.92 each.

#### NATIONAL BOARD OF MEDICAL EXAMINERS

The dates for the next two examinations of the National Board of Medical Examiners are as follows: Parts I and II, June 19, 20, 21, 22, and 23, 1922. Parts I and II, September 25, 26, 27, 28, and 29, 1922.

Applications for the June examination should be in the secretary's office not later than May 15, and for the September examination not later than June 1. Application blanks and circulars of information may be had by writing to the secretary, Dr. J. S. Rodman, 1310 Medical Arts Building, Philadelphia, Pa.



# INSTRUMENTS AND APPLIANCES

## PRESSURE PNEUMOTHORAX APPARATUS

By R. S. LOVING

*Captain, Medical Corps, United States Army*

(With two illustrations)

The pressure pneumothorax apparatus was devised by the author while on duty at U. S. Army General Hospital, Fort Bayard, N. M., as a war-time necessity. The one Robinson apparatus belonging to the hospital equipment was being used in the officers' infirmary and, on account of the danger of breakage, it was considered inadvisable to carry it back and forth between the buildings. A requisition for another Robinson apparatus was made but was disapproved. The enlisted men's infirmary was a ward of one hundred beds occupied by the most advanced cases of tuberculosis. The need for pneumothorax treatment was so evident in this ward that an improvised apparatus was made after the fashion of the Robinson, but it was clumsy and so difficult to operate that other attempts were made with a view to eliminating bulk. As a result of a series of experiments the pressure apparatus was evolved in April, 1920. It operated successfully in over three hundred treatments on army and War Risk patients at Fort Bayard and has since been used in the tuberculosis wards at William Beaumont General Hospital.

The pressure pneumothorax apparatus differs from those in common use in that the principle upon which air is discharged into the chest depends upon the force of compressed air rather than the weight of fluids as in the syphon apparatus. It has two manometers, a mercury manometer which registers the pressure within the container and determines the volume of air discharged, and a water manometer for registering the pressure within the pleural space. It has a filter incorporated which sterilizes the air as it leaves the machine.

Air is pumped by hand into a container. The mercury manometer registers in millimeters of mercury the pressure within. By experimentation it was found that in a container of about 2,000 c.c. capacity every 30 mm. of mercury pressure represented 100 c.c. of available air, therefore, 300 mm. of mercury represented 1,000 c.c. of air, and this was established as the capacity of the apparatus. By discharging air from the container under a graduate filled with water and inverted in a basin of water it was proven that each 100 c.c. of water displaced in the graduate corresponded exactly to a fall of 30 mm. of mercury

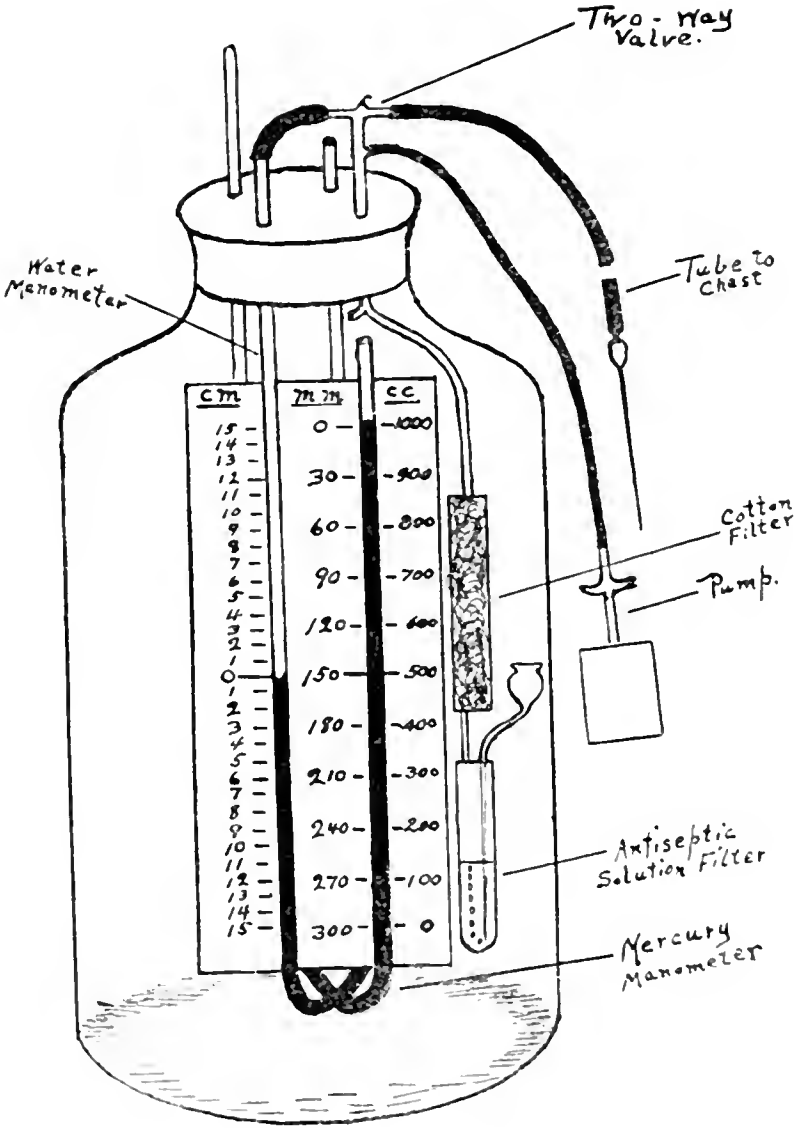
and that it operated uniformly at all pressures. It was determined also that the operation was the same in varying temperatures and at varying altitudes.

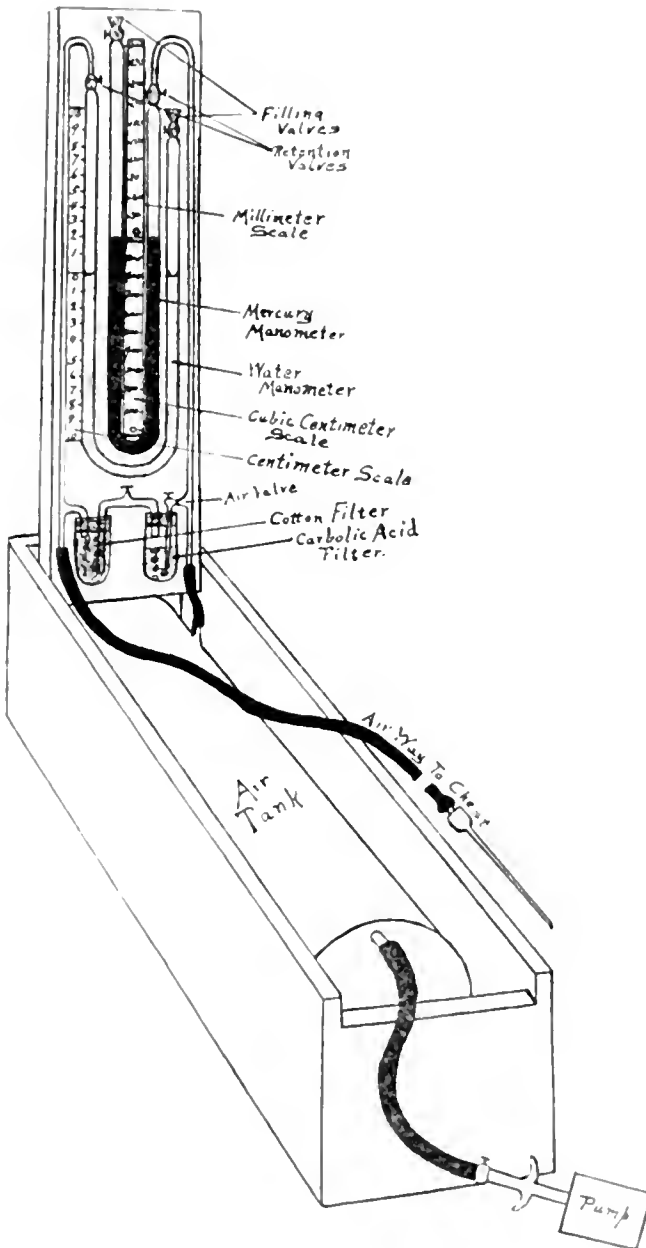
As air is discharged from the container it passes through two filters. The first contains an antiseptic solution, the second contains tightly packed sterile cotton. The air passes into the antiseptic solution through a glass tube drawn out to the caliber of a hair by which means it is divided into very minute bubbles, and at the same time the pressure of the air column is reduced. A further reduction in pressure is made by the tightly packed cotton in the second filter. The velocity of air expelled is again regulated at the outlet air valve where it can be reduced to an exactness of counting the bubbles as they pass through the filter or through the pneumothorax needle if placed in a glass of water. The pressure at full capacity and with the valve wide open is not very great, as the exit of air can be stopped by gentle pressure of the tip of the tongue against the rubber tube leading to the chest. The pressure of escaping air is never as high as that of confined air.

The two diagrams show different types of the pressure apparatus, but the principle on which they operate is the same. One uses a bottle container with the two manometers, filters and seal inside the bottle. The other has a metal container within a wooden box similar to the mercury blood pressure apparatus with the manometers and other working parts fastened to the under side of the lid. The bottle apparatus seems best adapted to hospital use, while the enclosed machine is more convenient for out-patient practice.

In the bottle arrangement only one limb of the two manometers is visible before the graduated scale. For this reason chest pressure is read in the water manometer below zero when positive and above zero when negative. The visible limb of the water manometer connects with the two-way valve on the top of the bottle and through it with the pleural cavity; the other limb opens through the stopper to normal atmospheric pressure. The visible limb of the mercury manometer opens at the top within the bottle and automatically registers the contained pressure; the other limb opens above the bottle.

The graduated scale has three columns of figures, that on the left indicating linear centimeters of water above and below zero, fifteen being the maximum in either direction. The middle column of figures indicates millimeters of mercury pressure within the bottle, 300 mm. being the limit. The scale on the right of the card is the measure of the air discharged from the bottle, each 100 c.c. corresponding to 30 mm. of mercury pressure; the capacity is 1,000 c.c. of available air. The latter scale reads from below up to correspond with the receding mercury as pressure is relieved by the escape of air.





The metal tube through which air enters and leaves the bottle is a double tube, one compartment for the entrance of air, the other for the exit of air. The three-way valve at the head of the air tube may be turned to two positions: one to allow the escape of air, and the other to connect the water manometer with the pleural space.

The air capacity of the bottle is 1,000 c.c., which ordinarily is more than enough for a single treatment. In case that more than the capacity is needed the container can quickly be recharged by a few strokes of the pump without removing the needle from the chest.

The metal container apparatus is rather the more complicated of the two, as many valves are necessary to prevent the loss of mercury and water from the manometers and fluid from the filter when the lid of the box is closed. The valves, however, make it possible to carry the machine in any position. The metal parts are all nickel plated; the tubes and manometers are sunk in grooves in the lid. The scales are sliding scales for quick adjustment to fluid levels in the manometers. The case is a trifle larger than that of the mercury blood pressure instrument.

The bottle apparatus is more convenient, having only one valve to operate and all parts being enclosed. It is more easily broken but is very inexpensive.

Either apparatus is light, easily moved and quickly recharged. They have been used for two years in tuberculosis hospital practice with very satisfactory results.

## BOOK REVIEWS

MODERN ITALIAN SURGERY, and Old Universities of Italy, by Paolo De Vecchi, M. D.; Corresponding Member of the Royal Academy of Medicine, Turin; Fellow American College of Surgeons. Fifteen full-page illustrations. New York: Paul B. Hoeber, 1921. Price, \$5.00 net.

The author begins this work by a short, interesting, historical sketch of the development of modern Italy, explaining the reasons for the defensive alliance with Germany and Austria, and the Austro-Hungarian attack upon Serbia as a justification of Italy's determination to keep absolutely neutral, notifying France to this effect, thus "giving her the chance of withdrawing half a million of troops just in time to press them on the Marne to save Paris from capture." He then goes on to tell of the splendid part which Italy took in carrying on the war against the Austro-Hungarian Empire, and the terrible sacrifices: 500,000 soldiers killed, 300,000 dead of disease contracted in the war, 800,000 wounded and 400,000 crippled for life. Basing his story upon these facts, he tells of the splendid work done by the American Red Cross in Italy, corroborative evidence of which he gives by publishing the report of the members of the American Red Cross Commission.

Chapters then follow upon the organization and work of the Medical Department of the Italian Army during the war, beginning with that of the Sanitary Service. There is a chapter telling of the teaching of advanced medical students during the war in hospitals near the front, by the leaders of the profession, with actual realities at hand for demonstration; also a chapter on Medical Organization and Efficiency during the war. The type and character of the work accomplished certainly compare favorably with that of any of the other Allies, and the assistance to invalids and the work of reconstruction was most efficient and praiseworthy. There are chapters on the Care of Cripples, and Orthopedic Surgery in Italy, attention being called to the fact that an Orthopedic Institution was founded in Florence as early as 1839. The author shows how this important department of surgery has grown and the surgical work that has been accomplished in special orthopedic clinics, particularly those at Milan, Bologna, and Naples. Having noted in his preface that little of Italian surgery is known by Americans, Doctor De Vecchi first defends modern surgery in Italy against what appears to be an unjustifiable slur by Sir Rickman John Godlee in his recent volume on Lord Lister, in which he speaks of the apathy of Italian surgeons to early (1878) accept and practice the Listerian doctrine. The reviewer, who had been educated in New York and had practiced antiseptic surgery "up to date" at a U. S. Army post more than 200 miles from a railroad, was surprised to see London surgeons, in 1883 and again in 1885, operating with the same precautions as to cleanliness as did their ancestors. For instance, in St. Bartholomew's Hospital a resection of the knee-joint by Thomas Smith (afterwards Sir Thomas), wearing an old blood-stained frock coat with the cuffs turned up. True, Mr. Bryant in Guy's Hospital, with coat off and sleeves rolled up, wore a little white apron, and used a pale iodine water to wash his wounds, and similar instances of the type of cleanliness and antiseptics might be told as witnessed in other hospitals in London.

Some one hundred pages are devoted to a description of the development and progress of the many universities of Italy and the great men who contributed to their present advanced condition, and how the products of these universities developed into the many surgeons whose contribution to surgical progress during the late war was unexcelled by that of any other nation.

This interesting book closes with a chapter on surgical literature contributed by Italy,



the chief details of which have been taken from the *Handbook of Italian Operative Surgery* by the distinguished surgeon, Prof. Davide Giordano of Venice.

Doctor De Vecchi has written an instructive and interesting book, instructive particularly from the standpoint of the military surgeon, more interesting perhaps to the general American surgeon in that he can be made to realize what wonderful opportunities for observation and instruction can be enjoyed by a visit to one or several Italian university clinics, where the best in surgery that the world knows may be seen. The names of only a few Italian surgeons, and they those who have developed a special treatment or operation, are known to American surgeons, and comparatively few have visited these men to learn at the hand of the master.

JOHN E. SUMMERS, M.D.

*THE MARINES HAVE ADVANCED*, by Lieut. Col. Giles Bishop, Jr. Illustrated. Philadelphia, Pa.: The Penn Publishing Co.

In this volume Colonel Bishop follows further the adventures of Dick Comstock, and it is in the same healthy style of narrative adventure as were its predecessors. Although the tale is woven about a mythical hero, Colonel Giles states in his preface that the main incidents are historically correct. It should prove interesting reading to boys in their teens, and a knowledge of the duties and adventures of a gallant service ought to be of value to the young readers and to the service itself when they grow old enough to possibly take an active part in the vicissitudes of this seafaring soldier service.

*THE MECHANICS OF THE DIGESTIVE TRACT*, by Walter C. Alvarez, M. D., Assistant Professor of Research Medicine, George Williams Hooper Foundation for Medical Research, University of California Medical School. With twenty-two illustrations. Octavo, cloth, pp. 192. Price, \$3.50. New York: Paul B. Hoeber.

This monograph on the mechanics of the digestive tract is an original contribution to medicine, the outcome of research work begun by the author nine years ago. The present knowledge of the processes of digestion is summarized and the experiments and clinical work upon which this knowledge rests is described concisely. The author goes into the subject of the gradient theory of digestive forces and the theory of peristalsis in detail, and holds that "the idea of a gradient of forces which can be flattened or reversed offers the best, the simplest, and often the only explanation for many phenomena observed by the physiologist, the internist, the roentgenologist and the surgeon." The conclusions are based on theories that appear to rest on proved facts, yet the author emphasizes that it is a theory and that much work yet remains to be done to give final acceptance to the conclusions.

The internist and surgeon will read this contribution with great profit. There are twenty-three pages of an extensive bibliography that enhance the value of the book.

L. A. NEWFIELD, M.D.

*PAPERS FROM THE MAYO FOUNDATION FOR MEDICAL EDUCATION AND RESEARCH AND THE GRADUATE SCHOOL OF MEDICINE OF THE UNIVERSITY OF MINNESOTA*, covering the period of 1915-1920. Octavo volume of 695 pages with 203 illustrations. Philadelphia and London: W. B. Saunders Company, 1921. Cloth, \$10.00 net.

The present volume, the first of a promised series, contains for the most part summaries and abstracts of theses presented for the degrees of Master of Science or Doctor of Philosophy by graduate medical students in the Mayo Foundation and the Medical School of the University of Minnesota. Some of the articles have been published elsewhere in scientific journals, while others are here presented for the first time.

The volume is of interest to the student of medicine and embodies in one volume material heretofore widely scattered.

L. A. NEWFIELD, M.D.

NEOPLASTIC DISEASES: A Treatise on Tumors, by James Ewing, M.D., Sc.D., Professor of Pathology at Cornell University Medical College, New York City. Second edition, revised and enlarged. Octavo of 1,054 pages with 514 illustrations. Philadelphia and London: W. B. Saunders Company, 1922. Cloth, \$12.00 net.

This book is one of the most complete and comprehensive volumes written on the subject of neoplasms. The object of the book, as stated by the author in the preface, is "to present within reasonable space and in accessible form the main features of the origin, structure and natural history of tumors." Emphasis has been put upon the dependence of the clinical course of tumors upon the histologic structure, and to enumerate and contrast the more striking clinical features which are often highly characteristic of different tumors.

The text is profusely illustrated by photographs of gross and microscopic pathological specimens. By the many authors cited as reference throughout the work, an idea may be had of the great amount of labor involved in the preparation of this treatise. A most extensive bibliography at the end of the book, consisting of almost twenty-five pages, adds great value to the volume, especially to one inclined to follow his research to the sources.

The book stands as a monument to an American pathologist, whose labor will undoubtedly call forth due appreciation for the time and energy devoted to the completion of a work of such merit. The book will not make a universal appeal, nor is it intended to be for the mere student of medicine, but rather for the graduate student, the clinician, and the surgeon, whose interest in all bearing on the subject of neoplasms is perforce at a high level and must remain so while medicine is groping in the dark, to unravel the fundamental factors in the causation and successful cure of malignant neoplasms.

L. A. NEWFIELD, M.D.

1920 COLLECTED PAPERS OF THE MAYO CLINIC, Rochester, Minn. Octavo of 1,392 pages, 446 illustrations. Philadelphia and London: W. B. Saunders Company. Cloth, \$12.00 net.

There are more contributors and more pages in this number than in its predecessor of last year. In general, the contents are of the same class as in other recent numbers, there being sections beginning with the Alimentary Tract, followed in succession by those on the Urogenital Organs; Ductless Glands; Heart; Blood; Skin and Syphilis; Head, Trunk and Extremities; Nerves; and lastly, under the head of General, a variety of subjects are discussed.

In studying the yearly publications of this great clinic, one is struck by the broadening of its field of work. There is an evident consciousness upon the part of the management that the science of surgery can only be based upon principles which are as fundamental as knowledge and experience have progressed. The working out of these principles requires incursions into all the elements of the body's embryological development and pathology, and a correlation of their dependent relationships. Thus we see a growing tendency to invade the field of internal medicine in its subdivisions, and a wise invasion it is.

Independent of the many excellent papers upon regional surgery giving the experience of the clinic to date, we note a study of Chronic Bradycardia, another an electrographic study of Angina Pectoris, both of these papers being based upon studies of large series of patients grouped in ages, with complicating myocardial disease. Such studies are chiefly of value to the surgeon in interpreting the desirability or justifiability of some special surgical interference. Rosenow has exhaustive papers (156 pages) on Studies in Influenza and Pneumonia. There is a well-illustrated paper on the Use of the Chisel and

Mallet in the Extraction of Teeth, which appeals to one's surgical sense but will hardly appeal to the viewpoint of a prospective patient. There is a report of 1,500 dental examinations with reference to systemic disease; 1,417 of these patients came for relief from various illnesses, and, as the reporter states, "it is obvious that these data differ markedly from the data of the general practitioner in dentistry." The other 83 patients were not referred from the clinical departments. The clinical examinations and findings in all instances were checked by full mouth roentgenograms; 1,417 of the 1,500 patients were referred by examining physicians, and of the number there were only 175, or 12.3 per cent, without infected teeth. It was noted that there was not a marked difference in the percentage of infected teeth in the different groups of cases. The highest percentage was 94.7 in patients with ear trouble, and the lowest was 87.5 per cent in patients with goitre. The real value of such a study can only be estimated by an equally careful examination of the same number of individuals of comparative ages and occupations who are in perfect health. No article upon systemic diseases secondary to tonsillar infections is noted in this publication. Can it be that a reaction from the extreme in this direction is about to take place, both with relation to the teeth and to the tonsils? Early better sanitation of the mouth and care of the teeth from childhood on will minimize infections of the teeth and tonsils and thus reduce in number the many different lesions which undoubtedly sometimes have the teeth and tonsils as sources of infection.

The brilliant pathologist of the clinic, Dr. W. C. McCarthy, makes a plea for a new clinical classification of neoplasms. Dr. W. J. Mayo writes entertainingly of his observations on South America. Dr. Mayo and Dr. Franklin Martin have by the telling of their journeys to South America rather opened the eyes of the medical profession of North America to South America itself, as well as to our ignorance of the education, cultivation, and advanced methods of practice of our colleagues in that country, little appreciated by physicians of the United States.

The vast storehouse of knowledge issued yearly in the Collected Papers of the Mayo Clinic is most valuable to any doctor, whatever his predilection for a particular line of practice.

JOHN E. SUMMERS, M.D.

**A HALF CENTURY OF PUBLIC HEALTH.** Jubilee Historical Volume of the American Public Health Association. Mazyek P. Ravenel, Editor-in-Chief. New York: American Public Health Association, 376 Seventh Ave. Pp. 461+xi. Cloth, \$5.25; stiff paper cover, \$3.75.

This interesting volume, issued to commemorate the fifty years of existence of the American Public Health Association, gives a picture of the remarkable progress made by science in the field of public health. Bacteriology, as it is known today, was at that time in its early infancy, and modern laboratory methods now generally employed were then unknown. The rôle of bacteria in the causation of disease had received laboratory verification at the hands of Pasteur only four years before the founding of the association.

As with bacteriology, so with the other branches of preventive medicine—the progress made during the past half century has been more marked than that of the preceding centuries. The extent to which science has placed man and his environment on a plane where good health and longevity are now at the disposal of people that are willing to avail themselves of the results of scientific progress is fully set forth in this volume. The contributors are specialists known throughout the scientific world.

This book should prove of great interest to every person interested in the progress of public health of this country.

L. A. NEWFIELD, M.D.

THE SURGICAL CLINICS OF NORTH AMERICA. Issued serially, every other month (six numbers per volume); octavo; illustrated. Volume 1, Number VI. Philadelphia and London: W. B. Saunders Company. Cloth, \$16.00

This number finishes the first volume of the Surgical Clinics of North America, formerly published as the Surgical Clinics of Chicago. Numbers have been published during the year from Philadelphia, New York, Boston, Chicago, Mayo Clinic, and again New York, the final Index number. A general review of the contents of the numbers and a study of the volume demonstrate the worth-whileness and, indeed, real value of the publication. Such a broad field has been covered that there are few subjects of progressive, vital interest to the profession that have not been discussed, and the contributors are men whose experience and accepted good qualifications for the task compare very favorably with those recognized as among the many able writers and teachers of the country. There is a fair evenness of the different clinics, and there are very few of them that cannot be read with profit, even by the man of experience.

There are twelve contributors to Number VI, which opens with a clinic by Dr. Howard Lillienthal on several interesting cases classified under the head of Surgery of the Chest. The doctor is recognized, and justly so, as the leading surgeon in America in the surgery of the chest, and anything he has to say on this subject deservedly receives attention. Dr. John J. Moorhead, who has gained an enviable reputation because of his valuable book on Traumatic Surgery, has an excellent clinic on Traumatic Inguinal Hernia, Traumatic Spondylitis, Multiple Fractures of the Left Upper Extremities and Shoulder Girdle, Revision of Laminectomy for Fractured Spine, Knee-Joint Injuries. Dr. Wm. A. Downes has a clinic on Jejunostomy, recommending it in the treatment of certain ulcers of the stomach and as a palliative measure in inoperable carcinoma of the stomach. From the practical clinical fact that a non-leaking, efficient jejunostomy can be made by means of a simple, double purse-string suture, a technique similar to that practiced by the younger Senn for a gastrostomy, and used by Gibson for the formation of a valvular fistula of the bladder, there would seem no reason for the elaborate, time-consuming though efficient technique illustrated by the author. Dr. Herbert Willy Meyer has a well-illustrated, practical clinic on Thiersch's Skin Grafting. He illustrates, however, an operation for the removal of an epithelioma of the outer canthus of the eye, a lesion which could have been much better treated by radium or the X-ray had the patient been referred to an expert in the use of these agents. Dr. Seward Erdman has a short, valuable clinic on High Enterostomy for Relief of Ileus Complicating Appendicitis, reporting three cases from Dr. Pool's service in the New York Hospital. One of the cases was fatal; the lives of the other two were unquestionably saved by the high enterostomy (jejunostomy). It is pleasing to note that the principle of a jejunostomy for intestinal obstruction, either mechanical or septic, as recommended by Bonney, has come to the attention of our eastern confreres. It was first recognized and practiced in this country by mid-western surgeons, and with an improvement upon the Nélaton technique. There are several other interesting clinics, one by Harold Neuhoef on The Surgery of the Nervous System, Surgery of the Cord, and of the Removal of a Giant Endothelioma of the Medulla. Dr. Wilensky also has an instructive clinic on Neurologic Findings in Cases of Skull Fracture, and the indices for treatment based upon these findings. There is a clinic by Dr. Frederick W. Bancroft reporting Two Cases of Acute Hematogenous Osteomyelitis of the Femur in Children, in which he concludes, from his clinical findings and experimental work carried out in the Laboratory of Surgical Research at Columbia University, that many times areas of dead bone will not be thrown off as sequestra, but as the infection is overcome some of these sequestra become organized and act largely as bone-grafts; therefore the type of operation performed should be conservative. He says he is "convinced from

our present knowledge of osteomyelitis in children that it is inadvisable in general to attempt to remove an entire shaft in the early treatment of acute osteomyelitis, as has been advised by some surgeons, for occasionally regeneration of new bone does not occur and we are faced with the problem of either marked deformity or secondary operations necessitating bone-grafts."

The writer believes that the publishers of the *Surgical Clinics of North America*, after their first year's experiment, are to be congratulated upon their efforts in producing the publication, and upon their selection of the contributors.

JOHN E. SUMMERS, M.D.

TRAITS D'UROLOGIE, by G. Marion. Two volumes octavo, comprising 1,050 pages. Paris: Masson et Cie, 1921. Price, 120 fr. net. Volume II.

The two volumes of this unusual treatise on urology together make up a work of 1,050 pages with 418 figures in black and colors in the text, and fifteen colored plates outside the text, altogether 81 colored figures.

Volume I, it may be noted, discusses the anatomy of the kidney, the calices and pelvis, the ureter, the bladder, the prostate, the urethra, both in men and women, methods of exploration of the urethra, prostate, seminal vesicles, bladder, ureter, kidney pelvis, and kidneys; likewise the technique of laboratory examinations, and general symptomatology and pathology. The main body of this volume is made up of discussions of the affections of the kidney and its pelvis; they cover the field of contusions, wounds, tuberculosis, the so-called surgical kidney, cancer and other tumors of the kidney, calculus of the kidney, anomalies, perinephritic affections, etc.

Volume II, the subject of this notice, discusses affections of the urethra, bladder, ureter, prostate, and penis. A number of pages are devoted to urological formulae, and finally the book is concluded by a splendid chapter of 204 pages giving the technique of operations—the subjects in the text of this volume, and that of surgery of the kidney and its pelvis in Volume I.

There are few men qualified to write a work on urology as is Dr. Marion, the distinguished surgeon in the service Civile de l'hôpital Lariboisière. As the publishers state, every work treating of a specialty is necessarily medico-surgical, but urology is, of all the domains of medicine, that where the activities of medicine and surgery parallel or converge and are most directly interested. In this volume one finds, as is claimed, excellent clinical descriptions of diseases, methods of examination and exploration, diagnosis, pathological anatomy, and above all the medical treatment and the technic of surgical intervention. The urological formulae are most valuable. Numerous antiseptic solutions for lavage of the urethra and of the bladder are given, the proper-strength solutions for injections or instillations in the treatment of different forms of urethritis—acute and chronic—and for tuberculosis of the bladder; means for intestinal antiseptic medication are discussed; likewise different formulae for acidification and alkalization of the urine; balsams, diuretic medication and the use of sedatives are clearly described. Dietetics are discussed in an accurate way regulating the kind and quality of food for each day, suitable for those suffering from the different affections of which the book treats. Hygiene and alimentation and medicaments advised in the different forms of lithiasis, and in renal tuberculosis operable and inoperable, are discussed. General advice, including alimentation and medication, is given to those suffering from hypertrophy of the prostate, from acute and chronic pyelonephritis, cystitis, etc. The writer regards this chapter, to which he has only briefly referred, as the best of its kind that he has seen in any textbook on urology.

The volume is, without doubt, a most useful one for any general practitioner, general

surgeon, or indeed, specialist, in urology, to own. What it discusses is up to date and is written by a leader in a country where the practice of urology has always been in the van.

JOHN E. SUMMERS, M.D.

**DISEASES OF THE SKIN AND THE ERUPTIVE FEVERS**, by Jay Frank Schamberg, M.D., Professor of Dermatology and Syphilis, Graduate School of Medicine, University of Pennsylvania. Fourth edition, thoroughly revised. Octavo of 626 pages; 265 illustrations. Philadelphia and London: W. B. Saunders Company, 1921. Cloth, \$5.00 net.

The present edition of this book has been revised and amplified to bring it up to date to include the recent advances in dermatology. New chapters have been added on the rarer dermatoses. The section describing syphilis has been entirely rewritten to conform with the newer ideas concerning the treatment of this disease. The illustrations are profuse and remarkably clear in demonstrating lesions of the skin. The text is brief, yet sufficiently explicit in describing the symptomatology, etiology, and diagnosis to enable one to form a clear clinical picture of the disease described.

This book has long been popular among students and physicians, and the present edition, issued six years since the last revision, should prove of equal popularity. The book can be heartily recommended as one worth while.

L. A. NEWFIELD, M.D.



## Obituary

Those of our membership whose deaths have been noted since our last report are as follows:

**Capt. Charles W. Halterman, M. C., U. S. Army.**

**Capt. Charles A. Johnson, M. C., U. S. Army.**

**Capt. Frederick A. Spafford, M. R. C., U. S. Army.**

# The Henry S. Wellcome Prizes

Competition open to all medical officers and former medical officers of the Army, Navy, Public Health Service, Organized Militia, U. S. Volunteers, and of the Reserves of the United States:

**PRIZE FIRST: A GOLD MEDAL AND \$300**

**PRIZE SECOND: A SILVER MEDAL AND \$200**

Competition for 1922 will be based on essays on prescribed subjects, as follows:

**First Prize.**—"A Plan for the Correlation of the Three Federal Medical Services in Preparation for War, During the Continuance of Hostilities and Through the Subsequent Period of Reconstruction."

**Second Prize.**—"Influences of the World War on the Development of Civil Practice."

Each competitor must furnish five copies of his competitive essay. Essays must not be signed with the true name of the writer, but are to be identified by a *nom de plume* or distinctive device. They must be forwarded to the Secretary of the Association of Military Surgeons of the United States, Army Medical Museum, Washington, D. C., so as to arrive at a date not later than September 15, 1922, and be accompanied by a sealed envelope marked on the outside with the fictitious name or device assumed by the writer and enclosing his true name, title and address. Essays must contain not less than 5,000 nor more than 20,000 words, exclusive of tables. The envelopes accompanying the winning essays will be opened at the annual, or other meeting, by the president, and the names of the successful contestants announced by him. The winning essays become the property of the Association and will be published in THE MILITARY SURGEON. The writers of the essays receiving "first honorable mention" will be awarded life membership in The Association of Military Surgeons, U. S.



# THE MILITARY SURGEON

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## A PLAN FOR THE CONSERVATION OF HEALTH OF MALES WITHIN THE SECOND DECADE OF LIFE IN RELATION TO MILITARY DEFENSE

By JAMES ROBB CHURCH

*Colonel, United States Army, Retired*

### THE WELLCOME SECOND PRIZE ESSAY, 1921

The immunity which the United States has enjoyed from liability to foreign entanglement is fast disappearing, or at any rate it is not on the same footing that it was ten years ago. Since then its international responsibilities have increased, and its interests have extended to many lands and have spread over many seas. In the growth of those interests, and in the struggle for commercial supremacy, which, in the future, the economic conditions of the Old World and a progressive civilization will make more acute, there lies danger not limited to individual nations but extending to whole races. Therefore it is the first duty of every country to improve the physical development of its people, so that each male, on arriving at the age of maturity, may be capable of bearing arms and contributing to the defence of the fatherland.

The conclusions which I have come to are that a nation whose system of recruitment is voluntary should use every effort to improve the physical development of the people so that all classes in an emergency should be equally capable of undertaking military service.<sup>1</sup>

The foregoing, written by Colonel Hill-Climo some eleven years before his country was involved in the World War and fourteen prior to our joining the issue, seems prophetic. Perhaps if the sound advice furnished in what he wrote had been better heeded there might have been less talk of "preparedness" and, alas, "unpreparedness" a decade later. His view need not be assessed altogether as the opinion of one of military training and tendencies, for there can be no doubt that the increased efficiency which would have accrued to the state in time of peace would have been just as much a material advantage as the ability to furnish a full quota of sturdy and physically trained young men for the defense of the country.

The successful working out and the application of a feasible plan might be regarded as Utopian, but with a world lately recovered from the staggering effect of an almost universal war, and seeking by limitation of armament to lessen the blood and money tax on humanity, the

<sup>1</sup> The Preservation of the Health of the Soldier; Lieut. Col. William Hill-Climo, M.D., M.R.C.S., *THE MILITARY SURGEON*, vol. Iiii (1903), p. 369.

idea may not be so impossible of accomplishment as might appear at first thought. Even if we set aside the advantage which a scheme of this sort would assure to a nation in the question of military defense, we cannot overlook the immense material advantage to the state which would accrue when the majority of the younger men, those of the second decade, were sound of body, and productive units and a relatively small number a charge to the nation for support. National defense and national health are interlocking conditions, but it by no means follows that the advantage from the war-time status will overshadow that which would accrue to the nation at peace.

The accomplishment of the condition desired, the conservation of the health of the young men of the nation, rests on three requirements as the grounds for its fulfillment. It is quite evident that there must be:

1. A scheme of practicable physical development, national in character, but not necessarily centralized under Federal control.

2. Some form of examination and physical measurement to determine the physical fitness of men between certain ages who would fall in this category.

3. A means whereby males of the second decade who might be physically unfit through a correctable disability could have that removed and be added to those of the war classification, "A," "fit for any duty."

While it is easy to set forth these fundamental necessities, it is not so simple a matter to specify the exact manner of their carrying out.

What is essential for the realization of a project of this nature is a national interest in its fulfillment. As soon as anything becomes obligatory it takes on the nature of a task, becomes difficult of accomplishment, and fails in complete realization. Legislation, either state or federal, along this path, while not wholly in the class of sumptuary laws, would probably be as difficult of enforcement as ever.

To accomplish anything for this physical uplifting of the young men there must be more than precise prescribing by the letter of the law as to what shall and shall not be.

It is incontestably true that the Greeks were an outstanding example of this natural and national love of the sound body and the perfection of it through hardy sports and the cultivation of physical fitness.

The national festivals of Greece were among the most important means for awakening and fostering the national spirit. No Barbarian was allowed to take part in them. They were open solely to citizens of Greece, or of the Greek colonies; and on these occasions the colonies were eager to assert their sense of union with the mother-land. Hence the festivals were attended by visitors and competitors from every part of the Greek world, from Rhodes and Cyrene, and from the Greek cities of "Greater Hellas" and of Sicily.

The national festivals attained their highest splendour during the time when the national spirit was aroused by the conflicts with the Barbarians which began about 500 and ended in 479 B. C.<sup>2</sup>

<sup>2</sup> Introduction to "The Odes of Pindar," by Sir John Sandys.

These sports were not prescribed, but were the spontaneous outcome of a national spirit which recognized the advantage of physical development as an asset to the state, and which sanely combined the element of sport with that of improvement in health and advancement of hygiene. There were four of these great festivals, the Olympian, Nemean, Pythian, and Isthmian, spaced throughout the year, and while the large interest was in physical competition, the pitting of athletic prizemen against athletic prizemen, there was still provision made for contests of the intelligence, in music and poetry, as evidence of which we have the "Odes of Pindar" written in celebration of the victors in these pan-Hellenic contests.

In our own revival of these Greek sports, our "Olympic Games," we have followed to some extent the program adopted by the Greeks in their festivals.

Our stadium is reproduced from those of that time. Mr. E. Norman Gardiner in his book, "Greek Athletic Sports and Festivals," gives as the order of events in the Olympian festival:

(1) Single stadium foot race; (2) double stadium foot race; (3) long race; (4) pentathlon, or competition in five events—foot race, long jump, throwing the discus, hurling the javelin, and wrestling; (5) wrestling; (6) boxing; (7) paneratism, a combination of boxing and wrestling; (8), (9) and (10) boys' foot races, boxing and wrestling; (11) race in armor; (12) chariot race; (13) horse race.

These exercises meant for the winner much more than an individual triumph in some special sport: it carried with it distinction to his locality and to his neighbors. The material prizes were wreaths or garlands; the real prize was the distinction of having demonstrated physical superiority: "I take the gods to witness," says a Greek youth, "that I would rather have a fair body than a kingly crown." And in this manner, through a magnification of what was in its essential merely a phase of athletic sport was built up a realization of the importance of bodily fitness, of physical health and strength. From the dictum "*mens sana in corpore sano*" it equally followed that higher physical cultivation assured also an improvement in moral health, for it has ever been true that he who would excel in athletic sports must be clean of mind as well as fit of body.

The Greeks were fortunate in the possession of this national love for, devotion to, physical culture; something which was ingrained in their make-up and not the product of an artificial civilization as were the sports of the amphitheater with the Romans.

With our own population made up of widely differing races through constant immigration, it is more of a problem to specify exact methods in the upbuilding of the physical man than it was with a nation of a single strain such as Greece.

Without impugning the patriotism of any of our citizens, interests in this country are so diversified that any national movement of this character must have behind it some very real incentive as an active "*vis a tergo*" to insure sweeping benefit.

It is true that there has been a steadily growing sense of the necessity for physical culture during the last half century, and this has been progressively greater during the last decade. The evidence of this is the extraordinary interest in athletic sports, the popularity of football, baseball, tennis, golf and kindred diversions. While this is true, it is also equally true that apart from our male population of the second decade there is a lamentably small proportion which takes active interest in this matter of better body building. Lack of opportunity accounts for a certain part of this indifference, for without public facilities open to those who lack sufficient income to follow sports the quest of a game must be subsidiary to the more pressing needs of earning a living. The vocation blots out the avocation.

For those who lack means to contribute to the upkeep of clubs, the recent trend takes the form of the establishment of municipal facilities for outdoor recreation. Many cities, in the development of their park systems, have recognized the growing demand for opportunity for outdoor games and have set aside part of their reservations for use as tennis courts, golf courses, baseball diamonds and general playgrounds. This is a move in the right direction, but until there is some incentive toward the use of these by more than a minority of the young men, the ideal condition will not be achieved. As the cult gains ground, more and more will take advantage of these facilities, and no doubt the young men of a decade or two hence will be much in advance, physically, of those of the present time. The question does not, however, concern the devotees of sport, for this fraction will always obtain in some way or other what they desire. It is the indifferent, the underdeveloped and the unfit who are our principal concern. The condition throughout the country at large is much the same as that represented on a small scale in any of our universities or colleges. There, we find, and always shall find, a certain number of hardy souls who are in the beginning physically fit, who continue along the path of athletics for the zest of the game and not for the benefit which accrues from it. Those who play football, baseball, or row in the crew are naturally the pick of the undergraduates. Their efforts represent a specialization in sport but cannot be taken as an index of the physical status of the student body as a whole.

These sports being in effect the postgraduate course in physical training, let us consider only the youths of slighter physique who are as yet in the kindergarten of sport and who for this very reason are more

acutely in need of development than their more advanced associates. In the interest of these very students of inferior physique we find in most universities a director of physical education, a methodical system of physical measurement and a prescribed course of gymnastics calculated to bring up to a respectable level all who are below the physical standard.

Since this is viable in university and school education, would it not be practicable if applied on a nation-wide scale? If undertaken in a rational and proper manner, the scheme might not be so visionary as would at first appear. Most authorities agree that a training which is to start with no previous foundation—that is to say, after the eighteenth year—will not be successful. To insure success, we must guarantee to the child certain regular, systematic and graded exercises and build on them for the completion of the structure.

Our school laws, enacted by the different states, require that up to a certain age children must attend school and are forbidden to engage in occupational pursuits to the exclusion of their education. If a child shall have escaped or evaded this term of instruction and come to the age of maturity still illiterate, it is difficult or impossible for the state to correct the deficiency without impinging on the personal liberty which is guaranteed to the citizen. We can prescribe mental training for our children, but when it comes to the question of following the same course in respect to those of mature years, any law to this effect would immediately savor too much of paternalism to be in any sense effective. If we can insist that the minors of our population be mentally schooled, it is no very radical step to insist that they shall have the advantage of bodily education also—that their physical development shall keep pace with their intellectual advancement. By so doing we not only restrict the number of illiterates in the community but also limit the number of those who would otherwise go out into life with inadequate physique, and thereby predisposed to disease or even to degeneracy.

What has been accomplished, so far, in this matter of compulsory physical education as a set off to mental education? Up to 1920 thirteen American states had passed compulsory physical education laws and twelve additional states had such bills before their legislatures. In 1915 the State of Illinois passed a physical training bill, and on May 25 of the same year it was signed by the governor and went into effect. This was the pioneer measure of this kind in this country. Twelve other states have since followed suit and, as above stated, there are, or were, in 1920, twelve more similar bills pending. This looks like the beginning of a complete legislative system of physical training for the entire nation. Its inculcation in schools, beginning at an age not greater than eight years, seems not only the most feasible manner of accomplish-

ing it but also resolves the problem which physical educators consider of prime importance, viz., the laying of an early foundation in work of this kind.

The law in the State of California provides that the school authorities in the public schools of the state (elementary and secondary) shall prescribe suitable courses of physical education for all pupils, except such as may be excused from training on account of physical disability. The aims of this physical education are stated to be:

To develop organic vigor, provide neuromuscular training, promote bodily and mental poise, correct postural defects, secure the more advanced forms of coordination, strength and endurance, and to provide such desirable moral and social qualities as appreciation of the value of cooperation, self-subordination and obedience to authority and higher ideals, courage and wholesome interest in truly recreational activities; to promote a hygienic school and home life, secure scientific sanitation of school buildings, playgrounds and athletic fields, and equipment thereof.

In the elementary California schools the time requirement averages "twenty minutes in each school day," and in the secondary schools "at least two hours each week while that school is in session." The law also provides for the employment of a competent supervisor, or of such special teachers of physical education as may be necessary, where the school system has a sufficient number of pupils to justify this course.

A State Supervisor of Physical Education is appointed under this law.

The Maryland law provides for elementary public schools at least fifteen minutes of physical training on each school day and also at least one hour of directed play weekly, outside of regular classroom work; for the high schools, at least one hour in each school week and also at least two hours of directed play or athletics weekly, for all pupils, outside of regular classroom work.

Other states have passed laws similar to those quoted, all along the line of improvement of the physical condition of the immature. The course of physical training is what shall be prescribed by the State Supervisor of Physical Training, subject to approval by the General Board.

This question of physical training of children in the schools has a wider application, a broader meaning than the application of some system of gymnastics to a certain number of children. Dr. Thomas A. Storey, inspector of physical training in New York State, says:<sup>3</sup>

Physical training or physical education, or whatever you choose to call this thing you are doing, is finding itself. The specialist in physical education, who thought yesterday that his concern was only with muscles, finds today that he must be engaged in building men and women; that he cannot limit himself to a part of the great problem; and that his

<sup>3</sup> State Legislation for Physical Training: Thomas A. Storey, M.D., Ph.D., Professor of Hygiene, College of the City of New York. *Physical Training*, vol. xv, No. 8 (June, 1919), p. 411.

duty, now a patriotic duty, brings him face to face with every influence that bears upon the physical, mental and moral health of the citizen of the present or the citizen of the future now under his care.

It is not alone the children who are being trained, it is the citizens of tomorrow. As the twig is bent, so inclines the tree. Men, even men of the second decade who have lacked primary and adolescent training of this character, whether it be the required régime of a legalized system or that voluntarily acquired through a love of sport for sport's sake, will show a certain inferiority when called on to perform physical tasks or physical "stunts" to which they are unaccustomed. For example, the National Playground Association of America's "Athletic Badge Test for Grammar School Boys of Thirteen Years and Over" places the standing broad jump qualifying mark at 6 feet 6 inches. In the New York City public schools in 1916, 7,652 boys qualified on this basis. Dr. James H. McCurdy states that, in the application of this test to a regiment in France, during a training era, 28 *per cent* of the regiment failed to jump over a ditch 6 feet wide in a standing broad jump. In the accepted scoring tables for adults in the 220-yard dash, 27 $\frac{1}{2}$  seconds is the zero mark. With this same regiment, and adding 2 $\frac{1}{2}$  seconds to this zero, on account of the service shoes worn, 17 *per cent* of the regiment failed to qualify in the required thirty seconds.<sup>4</sup>

In other words, 28 *per cent* of this body of adults failed in a standard set for boys of eighteen or under, and 17 *per cent* in one set for the normal adult. These findings illustrate the value of early education in physical culture: a value not only to the child at the time of the education but one which can be cashed in during later life.

The foregoing is sufficient to emphasize the importance of childhood training in relation to fitness in early manhood, the "males within the second decade." I have alluded, so far, only to the question of proper physical exercise and bodily education. There are still two other factors to be considered: the examination for detection of remediable physical defects and the possibility of correcting them. These factors are quite as important in the basic work among children as the direction of their energies into proper channels. The following facts demonstrate that they are not only essential to a healthy growing-up but productive of economic gain to the state.

Dr. McCurdy states that 80 *per cent* of all physical defects in children are easily remediable; that is, defective teeth, diseased or enlarged tonsils, adenoids, defective vision, and deficient musculature. He says:

Various estimates place the additional annual cost of educating pupils with defects at from \$27,000,000 to \$32,000,000. No careful separation has yet been made of the pro-

<sup>4</sup>*American Physical Education Review*, vol. xxv, No. 3, March, 1920, p. 101.

portion of this waste which is remediable as it includes the moron and probably some of the high-grade imbeciles in the public schools.

Burks, in his "Health and the School," page 5, says:

Investigations under the Russell Sage Foundation indicate that not less than 60 per cent of American school children are handicapped by removable physical defects, and that, as a result, they are making 9 per cent slower progress in their studies than they should. Children with seriously defective teeth, according to these investigations, fall six months behind in eight years. Half the school children of the nation—10,000,000—have bad teeth. Children with adenoids require a year and a month of extra schooling to complete eight grades. One-eighth of our 20,000,000 school children have adenoids. Children with enlarged glands require a year and a month overtime. Nearly half our children have enlarged glands.

Wallin, in his "Mental Health of the School Child," pages 288-289, reports that, in experimental studies of laggards and repeaters, an average improvement in scholarship of 57 per cent was shown even as a result of dental repairs.

These quotations emphasize the advantage of early attention to the physical condition and education of the school child and the dubious advantage of correcting defects during the period of adolescence or in later life.

McCurdy is quite emphatic on this point. He says:

All specific studies, however, in general indicate very large economic waste from failure to remove remediable physical defects during childhood. They cannot have anything like the same value when treatment is given after the educational period is largely complete. For this reason the early removal of these defects is essential to educational, military, or industrial efficiency.

The last sentence in the above quotation is worth thought. In it Dr. McCurdy links three important considerations, the three which are vitally essential to the well-being and efficiency of any nation. His plea is not founded on any single premise but envelops the three. It is by no means a plea for "militarism" but confirms the view of all advocates of universal training, viz., that over and above the advantages of physical preparedness for war, training will always make for advance in efficiency in time of peace, and will thus tend toward a reduction of the burden of individual taxation.

Some state laws, already referred to, provide for systematic examination of the school child. These should be definitely absolved from the stigma of "paternalism" in government, since we are quite habituated to statutes requiring vaccination and isolation of carriers of communicable disease. It is only a step further in the right direction. Provided that examinations of this character are made by competent professional authority, there is no rational objection to their institution and continuance. As to measures for the removal of revealed defects in childhood, these are either left to the parent and family physician or



else a way is shown to the poor to obtain necessary treatment at public dispensaries and free clinics. Such school examination, therefore, will not infringe on private medical practice, and the plan contains none of the fallacies attaching to compulsory health insurance.

From the foregoing it seems beyond doubt that physical and mental health should go hand in hand and that the two in combination will make for a better citizen morally, since clean living as the result of a well-balanced physique and clean thinking as the consequence of an educated mind inevitably tend to eliminate criminal tendencies save in the submerged tenth, the hopelessly degenerate, who is a pathologic rather than a normal factor. This statement brings to mind the teachings of Sir Thomas Lauder Brunton, the "Apostle of Preparedness," as he has been aptly called.

His volume of essays deals sanely, strongly and logically with the advantages of physical training, and he was broad enough to see beyond the physical side of the situation. In answer to Mr. Burns, who took issue with him in some of his beliefs, he says:

Mr. John Burns is quite right in thinking that physical training will not do everything to restore the deteriorated physique of the nation. As he very truly says, the fathers must drink less alcohol and the mothers less tea, and the food and surroundings of the child must be improved from birth onwards. But the boys and girls who are now at school will be fathers and mothers of the next generation, and if by physical training we can increase their strength they will not have the same craving for alcohol and tea, and they will have more inclination for exercise. They will be able to earn better wages and they will be able to give their children better food than they have had themselves; and in two or three generations we may hope to find the standard of English physique again rising to its proper height.

Quite as applicable to us of the United States now as it was then to our cousins of the British Isles.

As to the practical means of making all this accomplished fact, the legislation already enacted is a step in the right direction, but the lack of uniformity in state laws leads inevitably to the conclusion that the Federal Government should provide for a uniform and universal physical education of all children who are to be the men and women of the next generation. Right here the bogey of interference by Federal authority with state rights may be disposed of. It will be readily conceded that the economic abilities of the various states are of great variance. If we take the value of the taxable property of the various states in relation to the number of school children in the states, there is a maximum variation of \$28,400 for every school child in the state of the highest property valuation, \$2,100 in the lowest, and of the forty-eight states a mean of \$7,000, which is about three times that of the poorest. It is evident that existing wealth and human capacity for production make the ability

to support taxation, whence it follows that the state which is largely inferior in these resources will not be able to maintain a standard of education equal to one of greater material resources.

Since this question—the physical education of the prospective citizen—is a matter which concerns the Federal as well as the state government, it is plain that there should be no more objection to subsidies by the Federal Government for this purpose than for any other specific object within the state. Subsidies have been in effect in England for six hundred years and in the United States practically since the beginning of our government, when grants of land by the Federal Government to the states contained specific provisions for reservations for school purposes.

The object of this Federal legislation should be a control sufficient to guarantee a maximum as well as uniformity of results, not one which would prescribe uniformity of system or details.

The Executive Committee of the National Committee on Physical Education has laid down the following specific principles in respect to the drafting of a bill on this subject:

1. That Federal appropriations should be made to the states for the purpose of cooperating with the states in the promotion of the preparation of directors, supervisors and teachers of physical education and for the part payment of salaries of such directors, supervisors and teachers.

2. That the administration of this act shall be lodged in the Bureau of Education of the Department of the Interior.

3. That for the purpose of cooperation with the Bureau of Education in administration of those phases of physical education having to do with health examination and health supervision of school children and schools, special appropriation shall be made to the Public Health Service of the Treasury Department.

4. That the following conditions shall be observed:

- (a) That the relation of physical education to military training and service shall be defined.

- (b) That physical education must be equally for boys and girls.

- (c) That it must be designed for all boys and girls of school age.

- (d) That minimum time requirements should be prescribed but that fulfillment of time requirements cannot be taken as a measure of the fulfillment of the purposes of the law.

- (e) That standards of results must be prescribed in administrative regulations.

- (f) That specific provision should be made for cooperation with the State Normal School and other state schools for the preparation of teachers.

- (g) That the initiative and rights and privileges of the states must be carefully protected.

So much for the question of the initial education of those of the second decade who may be potential defenders of their country. It should be emphasized, however, that authorities make no concession to sex in respect to this matter of education of the body. It is equally

incumbent on the women to develop, and rightly so, since no sturdy race ever sprang from weakly mothers.

Other countries have recognized the necessity for this side of education; Sweden, Denmark, Switzerland, Japan, and our late Germanic foes have for a considerable period recognized the importance of the measure and have gone forward to meet it. Sir George Newman, in his report to the British Ministry of Health in 1919, says:

The war has compelled us to realize more clearly the value to the state of healthy, well-grown children and adolescents, and of all educational and social measures conducive to this end, a practical and comprehensive scheme of physical training stands in the foremost place.

In the same year a bill was introduced in the French Chamber of Deputies for compulsory physical education of all persons of either sex up to the age of twenty years. In our own country the Towner Bill is a piece of Federal legislation of the same character.

It is obvious from what has been so far stated that conservation of the health of our young men in the twenties entails more than a system of education and training begun after they have passed the period of adolescence. It involves as a prime requisite a foundation which must be laid in early youth, say not later than the eighth year, and continued to the seventeenth or eighteenth, the period at which the average minor finishes with his high-school course. Assuming this to be proved, through the statistics and opinions quoted, we may now take up the consideration of some measure of training to supplement this early physical education.

The recent war, through the draft records, furnished much interesting information as to the physical condition of men liable to military service (those of the second decade), and these records clearly indicate that we are more heavily burdened than we should be by defectives at this age of life.

In the monograph, "Defects Found in Drafted Men," prepared under the direction of the Surgeon General, by Majors A. G. Love, M. C., and Charles B. Davenport, S. C., the percentage of defects for young men from eighteen to thirty years of age is shown to be 468 per thousand or, approximately, 1,294,000 men. The authors state (p. 30):

It is clear that fully one-half of the defects found are not of such nature as to interfere seriously with the man performing services of the highest order in civil life.

Thirty-five per cent of the men examined throughout the country were rejected, and from the statement quoted above it is a conservative estimate to figure that at least 40 per cent of men exist in civil life with defects which interfere with vocational aptitude. In other words, more than 1,000,000 men between the ages of eighteen and thirty years

are not fully productive. Over 80 per cent of this 35 per cent of ineffectives fall under the following classification, according to the draft records:

	<i>Per cent</i>
Diseases of the bones and joints . . . . .	26
Special senses . . . . .	15
Cardio-vascular . . . . .	13
Nervous and mental . . . . .	10
Tuberculosis (pulmonary) . . . . .	9½
Defective physical development . . . . .	8

A large proportion of these defects are remediable during childhood, adolescence, or early manhood, and their existence as revealed by the examinations of the draft is a very cogent argument for a measure which would make for the lessening of their incidence.

Sir George Newman, in "An Outline of the Practice of Preventive Medicine," gives data of the same import. He states that during the year 1919 English workmen lost 14,000,000 weeks of work due to illness and that this illness did not include any absence of less than four days. He further states (p. 29):

The chief burden of sickness here recorded, and which led to a greater or less degree of sickness benefit and lost time, falls within the category of preventable disease.

Commenting on these two statements by British and American authorities, an editorial in "The American Physical Education Review"<sup>\*</sup> says:

It is evident from the careful studies of our own draft board and from the English studies that a considerable proportion of disease and physical inefficiency is preventable. It is criminal, from the economic standpoint and from the standpoint of the health and happiness of the people, for these conditions to continue. They will not continue if the American people see clearly the problem. America needs not only legislation compelling improved conditions but education and promotion which will secure improvements which can come only through the personal adoption of a health program by the individual and the community.

Much of this disability could have been obviated by a scheme of physical education beginning with entrance in school and carried through to the time of graduation. What can be accomplished by further education after that time? To answer this question, let us quote some figures from the annual report of the Surgeon General of the Navy relative to physical examination of the graduating class at Annapolis. The age of entrance there corresponds about to that of graduation from high school; the graduation age is in the early twenties. Therefore a close parallel may be drawn. Furthermore, the prospective midshipman has naturally done his intelligent best to fit himself physically for acceptance

<sup>\*</sup> Volume xxv, No. 2, February, 1920, p. 71

at the Naval Academy and therefore is, so far as he knows, in the best of shape.

On page 49 of the report referred to we find the following:

The final strength test of the graduating class was completed by the gymnasium medical officer on May 15. All members were found qualified in accordance with the approved recommendation of November 25, 1919, which permits a maximum defect of five muscle groups. It is hoped that with more emphasis placed on maintaining the physical condition, after once passing the strength test every one of the graduating class will be 100 per cent perfect. The following is the report of the above-mentioned tests:

PERCENTAGE OF AVERAGE DEFECTS OF FIRST-CLASS MIDSHIPMEN.

	Entrance test	October, 1919	April, 1920
No physical defects.....	7 63	67.47	63 94
1 to 5 defects.....	12 84	22.49	16 08
6 to 10 defects.....	15 28	5.88	.00
11 to 15 defects.....	18 40	1.03	.00
Over 20 defects.....	33 00	.34	.00

The above is, of course, not a fair comparison with conditions which confront the average young man in civil life, for he lacks not only the advanced conditions of hygiene and housing which the midshipman enjoys, but also the daily, systematic, obligatory instruction in physical education. It is valuable, however, as showing the maximum which can be attained, and as suggesting that it is quite within the capacity of the average young civilian to approximate to this limit. Granted that further physical education is desirable after the preliminary work in the schools, the question is as to the most practicable means by which this may be attained. As already suggested, it is not possible for a people of such mixed racial elements as ours to attain to the spontaneous open-air cult of a homogeneous people like the ancient Greeks.

There must be some system which will, at least at the start, make it incumbent on those of twenty or more to put forth their energies, to devote a certain part of each year, at least, to the training and exercise of their bodies. As physical fitness under such a system would undoubtedly become the rule rather than the exception, there would be less and less opposition to this system for nation-wide health.

Not long ago we had the solution of this question in our own hands. I refer to the agitation in respect to universal military training. One reason why this measure failed to find favor was the prefixing of the word "*compulsory*" before the rest of the caption. It was an unfortunate adjective; none of us likes to be coerced into undertaking any-

thing, even though it be manifestly and patently the wise and proper thing to do.

If this measure had not carried the obligatory clause, at least in plain statement; if the appeal had been made as one to patriotism, on the ground that personal physical betterment is a very real asset to the state as well as an individual advantage, there would undoubtedly have been less opposition to its enactment. While essentially a military measure, this was very far from being a true measure of its worth to the country as a whole. From the draft statistics quoted it is self-evident that any measure calculated to bring up the physical index of the nation as a whole would be of incalculable benefit from a commercial as well as a military standpoint. Wars bring in their wake an inevitable reaction against anything which savors of fighting or of the fighting forces. Given this attitude, it is at this time a difficult undertaking to establish any such project on a military or quasi-military footing.

To those who are "fed up" with all that concerns either Army or Navy, it must naturally appear that "nothing good can come out of Nazareth." As a matter of preparedness, of insurance against further war, or the shortening of the conflict should one arrive, the military man should of course welcome a project for universal military training. He is actuated by the same general spirit which governs any other citizen of the Republic, and with any other taxpayer he would welcome any project which would make for the advancement of the state and, through it, of the individuals which go to compose it.

In the last analysis it seems that the most feasible manner to carry out this "post-school" course of physical training would be by the method which has been proposed and rejected—universal service. This for the reason that it contains a patriotic appeal; that it would in this manner be something with which the Federal Government could deal without infringing on states rights; and also because there would be added to the element of physical development that of acquiring the rudiments, at least, of obedience, loyalty and discipline, all of which ever make for the social and business efficiency of the individual and for the gain of the nation.

Dr. Thomas A. Storey, in the *American Physical Education Review* for February, 1920, says:

But the war, at the same time, has shown with dramatic brilliancy the gains that may be secured through an intelligent and adequate application of physical education. Military training has become largely physical education. There will never again be an army trained wholly or even largely along the lines of military drill. Modern military training must be made up of patriotism, physical education in its broadest sense, and vocational training. The physical education that begins in infancy and continues through life will be the necessary preparation for citizenship, whether that citizenship serves in peace or

in war. If America can pay for such a preparation for war, it cannot afford not to provide even more carefully for peace.

If this view, expressed by a layman, were more commonly accepted as logical and true, there would be less difficulty in securing the adoption, by state and Federal Government, of a measure authorizing universal training. Whether it bore the qualifying adjective of "military" or not would be a minor consideration provided it made for the desired end. It is not beyond the memory of very many of us when military life and military physical education were made up of a series of tasks, altogether devoid of the element of either interest or competition. Setting-up drill and the routine of military instruction from fours right and left up to company and battalion formation formed the staple diet, healthful enough in itself, but as insipid and devoid of real human interest as a long-continued subsistence on nothing save beef and potatoes. The old order has passed and we have come to recognize that the results, both for the man and the state, are better if we inject some life into this devitalized program and allow the individual a chance to think as well as act—give him some opportunity for the exercise of his own initiative instead of making him at all times and under all conditions a blindly obedient pawn. We trained our citizen soldiers in this more enlightened manner of preparing them for the World War, and we upset the long established theory that "it takes two years to make an infantryman."

As an example of this latter-day spirit let us consider what was done in respect to the matter of training recruits for service. The following was in brief the program at Camp Gordon, Georgia, under the supervision of Capt. Thomas J. Browne, Commandant of the Physical and Bayonet Training School at that cantonment:

1. The standard set should be low enough so that, at the end of three months' training 90 per cent of the recruits should pass it.
2. Activities tested should be directly related to, or a part of, military practice.
3. The tests should be led up to by daily practice and should differ from such daily practice only in degree and not in kind.
4. The activities and tests must be simple in organization and technique.
5. The tests selected should be suitable for use in any military camp, or else have certain alternatives to fit local conditions.
6. They must require little or no equipment or apparatus.
7. The test should be typical of a group of activities.
8. Ordinarily tests should be taken in uniform without hat or blouse, but certain tests should call for at least light-combat equipment with rifle.
9. Tests must be of such a nature that they can be run off *en masse* with little waiting, everybody active.
10. Standards must be objective and not subjective; also they must be easily seen and measured, not only by the judge but by the participants.

11. The tests should represent all-round strength, skill and endurance, and should be few in number.

12. As much as possible the competitive element must be brought in; platoon against platoon, company against company, regiment against regiment.

In regard to these tests Captain Browne says: "Many apply to civilian practice as well. As an aid to those engaged in this problem, either in the Army or in civilian institutions, I would suggest consideration of these working ideas."

If we make use of comparative logic, what reason is there to object to certain procedures because they may be used in warfare any more than to refuse certain others because they are inherently associated with peace instead of conflict? The man who shoots a rifle may never be called on to train it against his fellow-man; he who drives an automobile may do so solely for his own profit or pleasure, yet in the event of a menace to his country his skill may be an asset to his nation.

Argue as we may, it is incontestable that any good citizen is both willing and anxious to protect himself and his fellow-citizens against aggressive warfare. His very being and allegiance are tacit and tantamount evidence of that fact. *Anything* which he does to keep himself in the best physical shape is an aid in this direction.

If we follow out pacifist logic to its reasonable end, it is quite evident that it is the duty of each and every citizen to so conduct himself that he shall be incapable, either mentally or physically, or both, of offering any physical defense, which is of course, the *reductio ad absurdum*.

From what has been said it seems fair to draw the conclusion that in addition to the school courses in physical education, primary and advanced, it is of importance to supplement this teaching by additional instruction which will carry the male, at least, through the second decade. By so doing we shall have practically continuous physical development from the eighth year on to the thirtieth, at which time those concerned will have derived the major benefit from such procedure and will, furthermore, be ready to give way to the coming generation.

As stated, it seems of minor importance whether this nation-wide training be carried out as a military factor or under civil auspices, *provided that the required result is obtained*. If we are not yet ready for the idea of universal training, then we must rely on and develop, so far as is possible, the alternative measures offered by the Reserve, the National Guard, the Citizens' Training Camps and the possible general awakening of the people to the importance of physical as well as mental education. Much along this last line is being, and can be, accomplished by the Public Health Service; its activities reach many of those requiring instruction in matters physical, not only as to the remedying of existing physical defects but also in the very important question of preventive



hygiene, if it is allowable to coin such a phrase. Education of the ignorant masses by this service and the spread of propaganda by it should make for a clearer understanding, a better comprehension, of the value to the state and the individual of a healthy and vigorous manhood—and womanhood.

To sum up, if the premises stated and the conclusions drawn are correct, if we are prepared to accept the statistics as to our national infirmities as developed by the findings of the draft board, it is quite evident that we are in need of some rational measure of corrective reform. From the legislative action of a number of the states it is evident that there is a sentiment to that effect in so far as the problem affects childhood life. That is a decided step toward the light. If to this can be added an intelligent training, along the same line, for those who have laid aside the toys of younger years to take up the responsibilities of citizenship, we shall have gone far toward meeting the condition which at present confronts us.

The plan which must be adopted by our government to best conserve the health of this fraction of the second decade is, then, manifestly as follows:

1. Universal state legislation, backed by Federal subsidy and under Federal control, to insure careful, scientific and uniform instruction in physical welfare and hygiene, both of the person and the home, for all children from the age of eight to eighteen years, and as necessary adjuncts to this.

- (a) Periodic examinations of the children to determine whether they have any remediable physical defect and also to determine whether they are making proper advance in physical development.

- (b) Practicable regulations providing for the removal of such defects (e.g., dental defects, adenoids, enlarged glands) either by private enterprise or through the agency of dispensaries and free clinics.

2. Instruction for the male population from the age of eighteen to thirty along this same line, save that it will necessarily be more advanced in character. The same physical examination for defects and analogous measures for their correction.

3. The instruction prescribed under (2) to be under Federal control and administered by the War Department in order that the necessary element of discipline and control be assured.

4. That this instruction be primarily directed to the further physical development of these young men without special attention, at first, to any hard and fast military training, i.e., drill with arms or problems bearing solely on the military side, since ordnance, accouterments and the manual of arms are apt to smack too much of "militarism" in the minds of our civilian population under existing conditions.

5. That this training be arranged according to such schedule that it will not interfere with economic conditions by taking away from industrial pursuits all men of these ages at the same time.

6. That in instituting this measure special emphasis be laid on the fact that it is not in the measure of a task but is a patriotic duty and one in which each citizen should take a proper pride, since it makes not only for better material for an army in the contingency

of war, but adds to peace time efficiency, to the reduction of individual taxation, and to the future benefit of the nation.

This system, so far as it relates to the training of those over the age of eighteen, is that which was adopted by Charlemagne and continued by the Swiss. It was based on the principle of reciprocity. Several citizens contributed to maintain a warrior during a period of training. When it was their turn for this universal training they were relieved of the tax which was borne by those who were not required at that time to take the course. In this way there was an equable distribution of the burden of taxation for this end. If it were necessary to levy a special tax in this country, it could be apportioned in the same way, and the per capita would not be of sufficient amount to burden the individual. This time-honored plan would not only be a saving to the nation by eliminating the care of the unfit, but would undoubtedly be a powerful aid in bringing the young men to such camps through the fact that they escape the tax during the particular year of training and through the feeling that all are treated alike in this respect. The motive of all such enterprises is patriotism; military administration is the mechanical arrangement for making them real and effective. The product of the two is the feeling engendered in the individual of the value to himself of *discipline*, i. e., in serving a larger motive than mere self-interest he becomes greater than himself, and through loyalty, subordination and obedience to orders, fits himself to command, in necessary situations, by first learning to obey.

It is frankly conceded that military instruction, *per se*, is secondary in this plan to the necessity of building up the health and strength of the individual, and through him that of the nation as a whole, but since we have during the last war demonstrated that the time for the schooling of a soldier can be substantially reduced, the important feature is to provide the material which will be available when the time arises. We maintain a regular army and navy as our first defense; if in addition to this we have a large force of man power in good physical shape and trained, at least in part, for duties which will devolve on it in the eventuality of war, we shall have done much for the military side as well as the civilian. Of course we shall never be 100 per cent perfect; we shall always be the variable approaching the limit, but even so, it is certainly not too visionary to believe that with these measures in operation we shall be able to make a better showing than 35 per cent of ineffectives among the young men of a nation so young as ours.



## SOME NOTES ON THE MEDICAL SERVICE OF THE ARMY, 1812-1839

By MAJOR CHARLES W. AYARS

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SOME time ago, while making a study of certain old records in the office of the Surgeon General of the Army, I came upon many statements of fact, theory, and conjecture bearing on the conduct of the Army, especially with reference to the medical service, during the period from 1812 to 1839. The stumbling and groping in the dark for a better understanding of the causes, treatment and control of disease are so strikingly shown, and the evident disregard, by others than the medical officers, of the necessity for any particular care of the men, sick or well, is so widely at variance with present-day practice, that it is believed these notes may be of particular interest to the readers of this journal.

The permanent military force established by the Act of Congress of March 16, 1802, was composed of 1 regiment of artillerists and engineers, with 1,627 officers and men; 2 regiments of infantry, with 807 officers and men each; and 2 surgeons and not to exceed 31 surgeon's mates. The latter corresponded with the later-day assistant surgeons. This medical personnel was attached to garrisons and posts, and not to troops as had been the custom prior to 1802.

The following additional force was authorized in 1808, for the period of five years: 5 regiments of infantry, with 850 officers and men each; 1 regiment of riflemen, with 850 officers and men; 1 regiment of light artillery, with 820 officers and men; 1 regiment of light dragoons, with 667 officers and men; and 1 surgeon and 1 surgeon's mate for each regiment. So at the beginning of the year 1812 we find the total authorized military strength to have been 9,828 officers and men, 10 surgeons, and 39 mates or assistant surgeons.

From that time up to 1821, the Army was augmented and diminished, and changes were made in its organization until March 2, 1821, when the peace establishment was fixed at 1 corps of engineers, 4 regiments of artillery and 7 regiments of infantry, with a Surgeon General,<sup>1</sup> 8 surgeons and 45 assistant surgeons; and up to July, 1838, there had been added 2 regiments of dragoons, 1 regiment of infantry, and 1 company to each of the four regiments of artillery, with an increase of 11 surgeons and 10 mates.

The number of more or less permanent military posts varied from about 40 in 1812 to about 75 in 1839, and they were scattered from New

<sup>1</sup> The office of Surgeon General was permanently established in 1818.

Hampshire to Louisiana and from Wisconsin to Florida. For probably half the period covered, 60 per cent of these posts were located in the two Carolinas, Georgia, Florida, and Louisiana. The country was new; transport of men and supplies at all times difficult, and very often impracticable; communication was slow and uncertain; and the posts on the South Atlantic seaboard and along the Mississippi River were largely situated in close proximity to extensive marshes and swamps.

Prior to 1834 the medical officer was not always one of the best of his profession but was picked up here or there, wherever a medical man could be found who was willing to accept service; but in June of the year mentioned, Congress enacted a law providing that thereafter no person should receive appointment as an assistant surgeon in the Army unless he had been examined and approved by an Army Medical Board, and that no person should receive appointment as surgeon unless he had served at least five years as an assistant surgeon.

It is interesting to note that the pay and emoluments of a surgeon in 1812 were \$45 per month pay, 3 rations a day or the equivalent in cash, and \$10 per month for forage when not furnished in kind, while a surgeon's mate received \$30 per month pay, 2 rations a day, and \$6 for forage. In 1816 the forage allowance for all officers was fixed at \$8 a month for each horse actually kept, not exceeding the number authorized. These rates of pay and allowances remained stationary until 1834, when a surgeon was allowed the pay and allowances of a major of the line (\$50 per month pay, 4 rations a day, and forage allowance); an assistant surgeon of more than five years' service, the pay and emoluments of a captain of the line (\$40 per month pay, 3 rations, and forage); and an assistant surgeon of less than five years' service, the pay and emoluments of a first lieutenant of the line (\$30 per month pay, 2 rations, and forage); and it was further provided that every surgeon and assistant surgeon who had served faithfully ten years in those grades should receive an increase of rations per day equal to the number of rations to which they were then entitled. In 1838 every commissioned officer of the line or staff, exclusive of general officers, was allowed an additional ration per day for every five years of service.

The value of the ration varied, of course, at different times, but it may be approximated at twenty cents, and it consisted of  $1\frac{1}{4}$  pounds of beef or  $\frac{3}{4}$  of a pound of pork; 18 ounces of bread or flour; 1 gill of rum, whiskey, or brandy; and at the rate of 2 quarts of salt, 4 quarts of vinegar, 4 pounds of soap, and  $1\frac{1}{2}$  pounds of candles to every 100 rations. In 1838 enlisted men were authorized to draw, in lieu of the spirits or whiskey, 6 pounds of coffee and 12 pounds of sugar to every 100 rations.

If any officer or man of the peace establishment was disabled by wounds or otherwise while in the line of his duty, he was placed on the *list of invalids* at such rate of pay, and under such regulations, as the President might direct. It was provided, however, that the compensation to be allowed a commissioned officer should not exceed, for the highest rate of disability, half the monthly pay of such officer at the time of his being disabled, but that no officer should receive more than half the pay of a lieutenant colonel. The monthly pay of a lieutenant colonel was \$60. The rate of compensation to enlisted men was not to exceed \$5 per month. It was also provided that inferior disabilities should entitle the person so disabled to receive an allowance proportionate to the highest disability. If any commissioned officer of the peace establishment died by reason of any wound received in actual service, the widow, or child or children under sixteen years of age, became entitled to receive half the monthly pay to which the deceased was entitled at the time of his death, for and during the term of five years.

That a slight comparison of the pay of the army surgeon with the average earnings of the civilian practitioner may be made, attention is invited to the fact that in 1820 a civilian physician contracted to attend the post of Greenbush, New York, recruiting parties in Albany, and officers at both places, and to furnish all medicines, for \$50 per month.

The lot of an army surgeon in those days was not a particularly enviable one, as is pretty well evidenced by the following remarks, made in 1829 by the Surgeon General in a recommendation to the Secretary of War for an increase of pay for medical officers:

The surgeons are not only confined to their original pay whatever may be the necessary increase of their expenses as they advance in life, but they are more constantly on duty than any other officers in service. For the number being barely sufficient to supply the several posts, they are seldom permitted to leave their stations, as no one else can perform their duties; and they are thus sometimes compelled in urgent cases to hire a substitute at their own expense, while at most of the interior posts even this is impracticable, and hence some have been on daily duty for ten years; whereas an officer of the line can at once be relieved by the next in command, or his place be supplied by one of the same grade. This is a consideration of no inconsiderable importance, not only comparatively in relation to others, but positively in relation to the surgeon himself; for cases have occurred where all the officers of a post have been repeatedly changed on account of their ill health, while the surgeon has been compelled to remain at the sacrifice, not only of his health, but in more than one instance, of his life, and a standing order has been issued that he shall in no case be so far from the garrison that he could not be called on in case of accident.

In his recommendation the Surgeon General also called attention to the case of the senior assistant surgeon, who had been in the service upwards of twenty years and was receiving the same pay that he received at his original appointment in 1806.

With this brief, general statement of the conditions of service during the period referred to, the following notes, for the most part extracts from Annual Reports of the Surgeon General to the Secretary of War, are submitted under the several subject-headings in accordance with which they have been arranged:

*Personnel.*—It appears that there was at no time a sufficient number of surgeons in the Army to meet its needs, and at the close of 1821 there were fifty-four posts and stations, with only forty-four medical officers in service. There were stations where, in the event of sickness or death of the surgeon, medical attendance could not be had for months. Such conditions make it clear that the maintenance of an adequate and efficient medical service was a matter of grave concern, yet we find that those on whom the responsibility for the solution of the problem rested were obliged to contend with many obstacles which cannot at this time be appreciated at their true worth. Some examples follow:

In 1813 a surgeon's mate resigned his commission because a certain doctor was appointed surgeon over the protests of the officers of the regiment.

Vacancies occurring at certain stations could not be filled, and the troops thereby deprived of the services of a medical officer, because junior officers serving elsewhere liked their stations and declined promotion rather than change them.

In May, 1818, a surgeon reported that, although he had been appointed in the preceding November and had received his orders, the inclemency of the weather had prevented him from joining his regiment, but that he intended to do so without further delay.

Another surgeon explained an extraordinarily long delay in complying with his orders by stating that he was absent from his station for some time attending a law suit in which he was concerned.

Report was made in August, 1819, that a surgeon apparently had not been on duty since the previous fall; at any rate no communication from him had been received at the Surgeon General's office since the previous September. In the case of another surgeon, the Surgeon General reported to the Secretary of War, in the same year, as follows: "Dr. —, who I am informed is at Baton Rouge, has not reported himself since the establishment of this office (more than a year previously). It is not known whether the several orders and communications sent him have been received. I have therefore to request that

he be directed to report the reason of this neglect of duty, or be dismissed from the service." Another surgeon who was ordered to Charleston in June, 1820, had not arrived there on the 16th of the following October, and his whereabouts were unknown; and still another one who was under orders for Council Bluffs was understood to be sick somewhere in Kentucky, but he had not reported himself.

Occurrences of this sort became so frequent that finally the Surgeon General, in an effort to improve conditions, made the following statement to the Secretary of War:

There are so many cases of surgeons holding commissions until they are driven from the service without joining, or perhaps even intending to join their corps, that if practicable it would appear that some mode of punishing them should be devised; at least when they are stricken from the rolls of the Army, that fact and the cause should be made known in the public papers.

That of the various duties, other than the care of the sick, with which the medical officer was charged, he selected for performance only those which appealed to him might be suspected from some of the following notations:

Under date of November 1, 1818, the Surgeon General opened his report to the Secretary of War, with the following statement: "So far as an opinion may be formed from the reports and returns for the quarter ending June 30 (*about one-half of which were received*) the Army was healthy. . .," and in 1819 he reported that of the qualifications of the different surgeons and mates little was known, as no communications whatever had been received from the Assistant Surgeons General, and but little reliance could be placed upon the partial representations of either friends or foes. He stated further, that it was not known, owing to the absence of reports from them, whether the Assistant Surgeons General had performed *any of the duties* required of them by regulations and orders.

In 1820, in touching on the frequent failure of surgeons to report causes of deaths, the Surgeon General remarked: "A circular letter was addressed to them on the 17th of August last, urging the necessity of a greater attention to the manner of making their reports and returns. Should this not produce the desired effect it will be necessary, after two years' indulgence, to adopt some more coercive measures"; and later on he made this report: "There are still a few medical officers who have neglected to attend to many of their essential duties, and they will shortly be reported that they may be either compelled to leave the service or to obey their orders and instructions."

On the other hand, it appears that the medical officer was occasionally

handicapped in the performance of his duties by causes beyond his control, as is indicated by the fact that in June, 1818, the surgeon at Pittsfield, Mass., reported that he had been on duty there since August 28, 1817, and had made no returns because no medicines had been received by him, although he had forwarded two sets of requisitions. It was frequently more than a year after requisition was made for them before supplies were received at the distant posts, and they were then found to be largely damaged.

*Recruits and Recruiting.*—While it was required that all recruits should be able-bodied, in view of the fact that commissioned officers employed in the recruiting service were entitled to receive \$2 for each recruit enlisted by them and mustered, it is easily conceivable that the expression "able-bodied" was without a standard interpretation; hence the condition which existed, as shown by the following examples of complaint, is not quite so strange as at first glance appears.

In 1818 there were reported from Baltimore, Maryland, a great number of cases of diarrhea and venereal diseases, principally among the recruits enlisted, among whom were also several cases of permanent and incurable complaints. This was cited by the reporting medical officer as one of the many instances of the gross neglect of surgeons attending recruiting parties, which, together with the willingness of many officers to enlist every man that offered, was constantly loading the Army with invalids. He added that this accommodating spirit was not at all necessary in order to obtain men, for the reason that an active and faithful recruiting officer would generally raise an effective company in less time than a negligent one would collect the same number of diseased drunkards. The surgeons in the vicinity of recruiting parties often complained of the "miserable beings sent to their hospitals for soldiers, with scarcely constitution left to keep them a month from the grave."

In 1819, a surgeon in commenting on the recruiting service remarked: "The management of the recruiting service is and has always been defective, because the importance of the duty has not been duly appreciated by officers of any grade. A man has too often been made a recruiting officer merely because he is fit for nothing else, or for his own convenience, it being frequently considered a kind of accommodating furlough, a license to frolic rather than an order for duty"; and again the importance which should have been attached to this duty is shown by the remarks of another medical officer in urging the necessity for due attention in the selection of recruits, and especially of employing them, for the first year at least, in learning to live in camp instead of exposing them at once to all the fatigues of a military life, as was too



generally done. He stated that "the fatigue and exposure that may be very well borne by a soldier after eighteen months' service will soon kill a recruit who has not learned to take care of himself when relieved from duty; for the mere labor is but a small part of the inconveniences of his new mode of life."

In 1820, the surgeon at Fort Gadsden, Florida, communicated to the Surgeon General that—

Recruits for this country should be of the first quality. Of those that have arrived several were old men from 40 to 50, two or three idiots, and generally intemperate. Such men cannot last long in this climate. Three of the deaths were of recruits belonging to the 7th; they were on the eve of the grave when left here; the four others were also recruits from the north, belonging to the artillery; two of them died of dysentery. One was a man of 50 and one an idiot; the two others died of typhus.

Lack of physical fitness, however, was not the only defect of the soldier which tended to increase the worries of the medical officer, for note the following remark made by one of them in 1819, and from which it would appear that our army of those days would not have contributed materially to the lessening of Diogenes' trouble:

The mere prescribing of medicines is but a small part of an army surgeon's duty. His hospital attendants are selected from the soldiers, and have for the most part neither the ability nor the inclination to perform the duties required of them, even when they are sober and honest, but in point of fact one constant source of complaint from almost every surgeon is that he can obtain but very few who possess either of those essential qualifications.

*Intemperance.*—As has previously been mentioned, 1 gill of rum, whiskey, or brandy was part of the daily ration of the soldier, and in 1819 Congress enacted that whenever it was found expedient to employ the Army at work on fortifications, in surveys, in cutting roads, and other constant labor of not less than ten days, the enlisted men so employed were to be allowed fifteen cents and an extra gill of whiskey or spirits each day, while so employed.

Instead of drinking the liquor daily as issued to them, the men very frequently "kegged" it, that is, kept it until there had been accumulated a sufficient quantity to allow of a drunken debauch. All through the reports for the period run constant complaints of the drunkenness of the soldiers, with the consequent lack of morale and efficiency, and many of the diseases and deaths then prevalent in the Army were attributed to the excessive use of whiskey.

With a total number of sixteen deaths reported for June, 1818, but few of them were accounted for, most of which were from excessive

intoxication, and "it may be proper to state that one surgeon has reported three deaths from this cause (the only cause) in one quarter, and closed his remarks by stating that of a company noted for drunkards 'these three might be said to lead the van,' an observation which indicates no small relaxation in general police in a garrison at a convenient distance from the intrusion of citizens." From Fort McHenry, Maryland, three deaths from typhus fever were reported in 1818, "which, however, were nearly the last struggles of constitutions worn out by intemperance," and of the twenty-one deaths in the Army reported for the quarter ended December 31, 1818, nearly all were attributed to excessive intemperance, and several of them were recruits just enlisted.

In 1819 it was reported that the diseases arising from intemperance were unfortunately too deeply rooted in the mass of the population to be entirely eradicated from the Army, and that *sudden death from intoxication* was a heavy item in the bills of mortality. The Surgeon General informed the Secretary of War that he was convinced of the propriety and even necessity of striking the whiskey altogether from the ration, having made inquiries during the summer of the probable effect of such a change, and receiving but one opinion from all those whose experience entitled them to full faith on the subject. He therefore made the most unequivocal recommendation of the measure, and further stated that the objections usually made to its elimination were entirely groundless. Upon the recruiting service it could have no effect but a beneficial one, for the man with whom rum was an inducement to enlist was not worth having, and such recruits were the pest of the Army, both by their practice and by their example. Also the manner in which the whiskey was generally disposed of by the soldiers proved that the change would be objected to only by those who ought on every account to be deprived of it altogether and were only useful at those times when it was stopped from them by way of punishment; that most of the efficient men did not drink it at all, and they either sold their ration to the sutler or to their intemperate comrades, who thereby obtained the means of continual intoxication, or else it was *kegged* for a drunken debauch, which was always followed by numerous irregularities and frequent punishments, and often gave rise to a career of intemperance. Too generally it was issued in the morning and used as a *dram*, the most pernicious of all modes of disposing of it; in fine, the last use it was put to in the Army was that of a stimulating drink with the soldier's meals, the only one it could have been intended for.

Again in 1825, the Surgeon General addressed the Secretary of War as follows:

The deaths from intemperance and its various consequences have been numerous. Out of the whole number, 116 (during the period of one year), forty may be traced to this pest of the Army, under the different forms of liver diseases, dropsy, consumption, apoplexy, palsy, etc. Notwithstanding the minor objections which have been made to a change in the soldier's ration, it is believed it will be found expedient, if not necessary, to furnish some other liquor in lieu of whiskey, which should only be issued under peculiar circumstances, and at the discretion of commanding officers. During the last year 108 were discharged from the hospitals alone, in consequence of incurable complaints, proceeding mainly from this cause.

During the year 1829, in consequence of the sickness of the surgeon at Oglethorpe Barracks, Georgia, a private physician was employed, and the number of deaths in that command for the quarter was twenty-three, being nearly one-fourth of the whole command of ninety-five. The chief diseases were reported to have been bilious, intermittent, and remittent fevers, and that with few exceptions the twenty-three deaths were caused by relapses in consequence of excessive intemperance. It was stated further "that these excesses were indulged at the public expense is most probable as the extra bills for hospital stores at this station for a short period were 75 per cent more than the amount paid for the whole annual supply furnished on the requisition of the surgeon of the post."

In 1830, the Surgeon General made this report:

Several of the surgeons advert as usual to effects of intemperate habits on the health of the men. This subject has frequently been reported to the department, and various plans proposed for its prevention; that recently adopted at Fort M'Henry, however, appears to offer the most speedy and effectual remedy. An entire change is stated to have taken place in the deportment of the men, and the surgeon had not seen an instance of inebriation for two months, although there is a tavern a few yards from the garrison. The command consists of about 100 men, 96 of whom voluntarily signed a request to the commanding officer that their rations of whiskey might be retained and the proceeds applied to the company messes, and of these, 49 signed the constitution of an association to abstain altogether from ardent spirits and *in all suitable ways to discountenance the use of them in the Army*. The extensive and beneficial effects of such voluntary association in different parts of the country is notorious, and the experiment now made in the Army shows that similar results may confidently be expected should effectual means be adopted to introduce and encourage them. To this end a copy of the constitution of the society at Fort M'Henry is enclosed, and also a letter of the secretary, stating its good effects upon the deportment of the men, and it is recommended that blank forms be prepared and distributed to the several military posts and stations, with an order from the department requiring the officers to use their exertions to establish similar societies in their respective commands.

The records do not show whether or not the recommendation was followed, but that the formation of the society at Fort McHenry continued beneficial in its effect is manifested by this later report from the surgeon at that post:

The good resulting from the disuse of ardent spirits is manifest in the evidently improved health, happiness and morals of the soldiers. Prior to the temperance association in the garrison, scarcely a day passed without the disagreeable necessity of someone being confined for drunkenness or consequent misconduct, and in short, all unmilitary and disgraceful habits were plainly to be traced in a greater or less degree to the indulgence in the use of ardent spirits. But since coffee has been used as a substitute for whiskey, instead of bickering and petty quarrels, a cordial spirit of good fellowship now exists among the men; their arms and accouterments (I am informed by their officers) were never in better order, and instances of inebriety and profane swearing are daily becoming less frequent.

However, the excessive use of alcohol was not confined to the enlisted men, as is shown by the fact that in 1819 the commanding officer at Prairie du Chien reported that the conduct of the post surgeon was unpardonable, in that, although the troops and citizens were afflicted in the most serious manner by the fever, the surgeon had been dead drunk and wholly incompetent to do anything for them; and in 1819 a surgeon's mate was reported unfit for his duties in consequence of intemperance.

*Treatment of the Men.*—While we have learned from the foregoing that, even in time of peace, life in the Army was of more than average strenuousness, we would not expect to find conditions which would not be tolerated in actual warfare of the present day, yet from the following it appears that such was the case.

This report is of record as having been made in 1818:

There is probably no service in which officers appear to pay so little respect to the character of the soldier as in ours, or in which so little attention is given to their comfort, convenience and health. They are not only put upon menial and fatiguing duties for the accommodation of officers, but even loaned like so many negroes to the citizens. Young officers particularly are too apt to think only of what will subserve their pleasure and convenience, or what fatigue and exposure a man may undergo without immediate danger. An instance of this may be observed in those posts surrounded by water, and which has often been noticed by surgeons. The bargemen are frequently dispatched "to town" without being allowed to break their fast, where they are perhaps detained the greater part of the day, wet and cold, without an extra garment to protect them from the effects of all these causes of disease, or of the exposure consequent to severe exercise. Another cause of these complaints arises from want of exertion on the part of officers to procure their men the supplies to which they are entitled, in

consequence of a most objectionable habit of considering their duty done if they make out regular requisitions, and give themselves no more trouble on the subject." (Annual Report of the Surgeon General, November 1, 1818.)

In 1819, report was made that the Rifle Regiment on the Missouri River had been very healthy, only a few cases of inflammatory fever being reported. The surgeon also stated that—

several cases reported under the head of "all other diseases" proceeded from severe flagellation inflicted on the soldiers contrary to the act for the abolition of punishment with stripes, . . . not only the punishment directed by courts-martial is frequently commuted for lashes, but even company officers dictated often by caprice, without the sanction of a court, habitually inflict corporal punishment on their men with stripes to such a degree of severity as frequently requires medical attendance, and often deprives the Government of their services. (Annual Report of the Surgeon General, May 1, 1819.)

During June, 1821, at Baton Rouge, there were 167 cases of sickness, with ten deaths, and the surgeon reported that "most of the disease, and particularly those cases of a severe type, were almost solely the consequences of severe labour and exposure; that those men employed in getting timber from the swamps of the Mississippi River, some 10 or 15 miles above Baton Rouge, had been uncommonly sick, and the diseases contracted by them of the severest character and usually fatal." He added that "the duties required of the soldiery at this place since the commencement of the public works have not only been laborious and severe in the extreme, but judging as I do from observation, and a conviction of the consequences, inhuman and unjust."

*Prevalent Diseases and Some Attributable Causes.*—During the decade, 1820 to 1829, there were 2,293 deaths in the Army from disease, and of these 52.62 per cent were distributed as follows:

	<i>Per cent</i>
Alcoholism.....	9.07
Dysentery and diarrhea.....	11.38
Tuberculosis.....	8.46
Scurvy.....	8.59
Typhus fever.....	4.40
Yellow fever.....	5.84
Other fevers.....	4.88

leaving 47.38 per cent from all other causes.

Year after year, reports of deaths were made with no causes assigned in many instances, and it is more than probable that doubt, rather than the lack of appreciation of the importance of such records, was the reason for this, for otherwise it may fairly be assumed that no causes whatever

would have been assigned in many instances of death reported from quite common causes.

Many of the given causes of sickness and death are rather interesting, and in some instances fantastic, when considered from the viewpoint of modern scientific knowledge. Among them may be mentioned old buildings, ponds, and a graveyard situated near a post; a peculiar state of the atmosphere; exposure incident to digging wells; typhus fever due to the smallness of the hospital; inflammatory, remittent and intermittent fevers, and bilious colic, arising from the noxious exhalations proceeding from low, wet lands; the absence of rain; too much rain; the location of rice fields in the vicinity of barracks; the contraction of yellow fever through the severity of duties; and in the year 1818, in commenting on the prevalent diseases, this statement was made: "Occasional cases of typhus fever will always occur; but wherever it prevails it must arise either from exposure to fatigue in inclement weather without suitable clothing, from impure air in crowded rooms badly ventilated, or from the putrid effluvia of dead animals and vegetable matter; and as the number reported is few, it is probable neither of these causes has existed." The following extracts are typical of the conception of that day of the etiology of these diseases:

1818. That diarrhea and dysentery depend principally upon some peculiarities in the soldiers' mode of life must be obvious from the circumstances that they are at all times the most numerous in the catalogue of Army diseases; though it is equally certain that they may be produced by certain combinations of local circumstances, and that these are different at different places. Doctor ——— reports that in July, one company quartered in the barracks at Belle Fontaine were perfectly healthy while three others who were in tents were severely afflicted with dysentery, and justly attributes that to their exposure to the hot sun at noon and frequent violent rains at night. The dysentery has also prevailed at Plattsburg, but here also the causes were occasional and local, it having appeared as an epidemic and of course affected both soldiers and citizens. Whatever may be the remote causes, however, the immediate ones are in general either irritating matter in the stomach and intestines or a primary diseased action of the skin; the former arising from improper diet and the latter from undue exposure to the weather, and a deficiency of clothing adapted to the climate. The first is the most important, as the second will seldom produce the effect alone, though it is the chief cause of the obstinacy of the disease when once produced.

1819. In the Northern Division consumption and intemperance are as usual the chief causes of death. The former being endemic of the eastern section of the Union can only be prevented by proper attention to the clothing and quarters of the men and by suitable vigilance of the surgeons attending recruiting rendezvous.

At Forts McHenry and Severn a violent bilious colic with frequent

attacks of inflammation of the brain, ending in delirium, apoplexy, and death, have prevailed for the last year, and attempts have been made to ascertain the cause and to remove it if possible. (*Meningitis?*)

1820. In commenting on the causes of sickness at the posts from Georgia to Mississippi, largely diarrhea, dysentery, inflammatory, intermittent, and remittent fevers, the Surgeon General stated: "From the remarks of the surgeons it appears that the prevalence of these complaints depends upon local causes, and of course is but little affected by any care or regulations of the commanding officer, or the medical attendant"; and touching on the important bearing proper food and clothing had on the health of the soldier, he expressed the opinion that "a good sutler at a distant post will save more lives and at much less expense than a good surgeon."

The only posts in the North Division at which the diseases or their consequences afford anything worthy of observation are Forts Millin, McHenry, Severn, and St. Peters. Every exertion has been made to ascertain the causes of the diseases which have appeared at Fort McHenry for some time past, without any very satisfactory result. Formerly intermittent, remittent and bilious fevers prevailed; these were succeeded by a violent and often fatal colic, and this by sudden and incurable convulsions, the two first being entirely superseded by its more powerful successor. From March, 1819, to March, 1820, the number of cases of convulsions was 39; the number of deaths during the same period was 21, of which 16 were from convulsions, 3 from yellow fever, 1 from consumption, and 1 from dropsy. As yellow fever was only the epidemic of a particular season, convulsions appear to have absorbed every other complaint.

It has been suggested in former reports that the prevalent diseases at this post have probably arisen from a vitiated atmosphere produced by local causes. That this is the case seems further probable from the following considerations: There does not appear to be a sufficient difference between the diet, regimen, police, etc., at this post and others to account for the long continuance of diseases of a particular type. The complaints at this place are not of the kind usually produced by such causes, which generally affect the digestive organs, the lungs, and the circulating system. It was observed that when the troops were encamped at a distance from the fort during the last summer the prevailing complaint was much diminished. These diseases are of the class which have been supposed more particularly to depend upon what has been termed a "constitution of the atmosphere," the variations of which are thought to arise partly from its sensible changes as given in meteorological tables, and partly from those which we have at present no means of detecting.

These changes may be either general, producing those epidemics which affect large districts and sometimes a whole continent; or local, giving rise to diseases peculiar to certain places. The diseases thus produced are distinguished first by primarily affecting the brain and nerves, and hence usually the whole system, producing the various

forms of fever, many of which, however, are characterized by a determination to some particular part, as the brain, lungs, stomach, etc.; sometimes the local complaint is so marked as to attract nearly all the physician's attention, at others the whole nervous system, and especially the brain, is so strongly impressed as to give no time for reaction, and hence, convulsions, palsy, and sudden death are the consequences. (*Meningitis and Typhoid?*) Second, by the symptoms of those diseases which immediately succeed each other and are to a certain extent similar and require a correspondent treatment. Hence upon the appearance of a new disease of this class, the nature of which cannot be at first accurately ascertained, it is necessary carefully to compare it with those which preceded it. Third, no two of these complaints can exist to any extent at the same time, and the prevailing one soon absorbs all others. Fourth, both a general and local constitution of the atmosphere are for the most part permanently changed by one of the same kind; but altho' an epidemic from a general one will for a time become almost the exclusive disease and even communicate more or less of its symptoms to those which exist with it, yet so soon as its influence is exhausted the same complaint which prevailed at its commencement will often reappear, the "constitution" from local causes being only oppressed but not destroyed.

Since, then, the diseases which have prevailed at this post are of the same character as those which are presumed to arise from a peculiar state of the atmosphere, and since no other adequate cause can be assigned, this is most probably the true one. At one time they were supposed to proceed chiefly from intemperance, and it has, no doubt, had a great effect by predisposing the system to those morbid irritations which more especially affect the brain and nerves; and hence hard drinkers are always most liable to diseases of this class, as yellow fever, etc., but the complaints which are produced directly by an excessive use of ardent spirits are usually of a very different kind from these, tho' equally fatal. Improper diet has also been assigned as a cause, but if this had any effect it must have been the same as intemperance in drinking, and for the same reasons, hence no permanent benefit was derived from a change of diet, or stopping the issue of whiskey. If this view be correct, although little can be suggested by way of preventive, it will at least determine what is not the cause, and thus prevent loss of time in useless experiments.

The South Division was reported as generally healthy, with the whole number of deaths at 188, of which 157 were from scurvy at Council Bluffs, and while it was recognized that the disease "is generally produced by an almost exclusive use of animal food," it was stated that "an excessive use of spirits alone will produce" scurvy, and always gave a disposition to it, as appeared from the ill-conditioned ulcers which affected old drunkards.

1821. The troops at Fernandina have become vastly more healthy than heretofore; which Dr. — considers to have arisen from the establishment of regular messes, the attention given to cooking, and



supplying the men with tea, coffee, sugar, etc., in place of the ration of whiskey, which they voluntarily relinquished.

1822. The troops have been so remarkably healthy during the present quarters, and the complaints so slight, that no particular remark is required. *There were but 54 deaths.*

1823. With reference to St. Marks, Fla.:

The disease here also was the bilious remittent fever, the number of cases 68, and the deaths but 5. The local or existing causes of this disease at Pensacola were the excessive filth of the place, the unusual quantity of rain in July, followed by a great degree of heat in August, and the introduction of a quantity of putrid fish into the city. Those at St. Marks were the unusually low tides by which a large quantity of putrid vegetable matter was exposed to the sun, the prevalence of east winds coming over an extensive marshy country, having the same effect as westerly winds at St. Augustine, and from the same causes, and a failure in the crop of summer vegetables, so essential to health in a warm climate. To these causes must be added *the most important and essential one—the peculiar and general constitution of the atmosphere*, which was indicated by the prevalence of remittent and bilious fevers in most parts of the country, and without which these local causes appear to be nearly innoxious, as they are found in other places and in other seasons to a much greater extent without producing this effect. The peculiar diseases which often affect animals previous to an extensive epidemic is also another proof of this general cause, as was the case near Pensacola in June, when great numbers of dogs, foxes, and panthers died; as is the fact that the diseases commenced at the same time at Pensacola, and St. Marks, where the alleged local causes were different.

Baton Rouge is the only post at which there has been much sickness during the present quarter. There were 29 deaths at this place and only 21 at all the other posts. The garrison consisted of about 400 men, three-fourths of them recruits. The causes of disease were mainly attributed, as heretofore, to the following: 1st, recruits not acclimated; 2nd, severe labor and consequent exposure; 3rd, the construction of the barracks; 4th, intemperance. . . . Several old buildings, two ponds, and a grave yard situated southerly of the garrison, contribute to materially increase the number of sick.

1824. At Petite Coquilles, however, there were several cases of bilious fever, one of which was fatal. The weather during this quarter has been unusually hot; no rain has fallen for the last six weeks. The marshes, by which we are on all sides encompassed, are uncovered by water. The exhalations from them during the nights are intolerable. To these causes, together with the unfitness of the building occupied as barracks, may be attributed the existence of so many cases of bilious, inflammatory, and remittent fever during the quarter.

The aggregate mean strength of the Army for the year ended September 30, 1839, was 8,950; the number of sick, 22,248, and of deaths, 214, from which it is seen that the proportion of cases of disease to the

number of men in service was as  $2\frac{1}{2}$  to 1, or 249 per cent. The ratio of deaths to the number of men was as 1 to 42, or 2.4 per cent.

*Sanitation.*—Sanitation, as we know it, was, on account of the extremely limited knowledge of the causes and prevention of disease, of course practically non-existent, and the subject is only superficially touched upon in these reports. A few examples are given, all of them for the year 1827.

At Fort Delaware the chief complaint was inflammation of the intestines, accompanied with symptoms peculiar to the introduction of some preparation of lead into the system, and it was supposed by the surgeon to have arisen from the use of drinking water conducted into cisterns from an extensive and badly painted roof.

The surgeon at Fort Brady, Michigan, reported that he had particularly noticed the practice of cleaning the floors of the soldiers' barracks by frequent throwing over them of large quantities of water instead of washing and scrubbing them; in consequence of which both the boards and joists were kept constantly wet and were soon brought into that state of decay and decomposition which, being combined with moisture, were known to be the prolific source of disease under all circumstances. He further stated that the fact was so perfectly established that there could be little doubt that no inconsiderable portion of the diseases at the posts where the practice prevailed arose from that cause, particularly intermittent, remittent, and typhus fever, as well as diarrhea and dysentery.

At Fort Monroe, Va., the use of sheet lead for covering the furnaces in the kitchens of two of the companies, as well as that of the covers of the boilers, which were painted over before each weekly inspection, proved most disastrous in its consequences. The surgeon stated it escaped his observation for two or three weeks, when its effects suggested an examination and immediate removal. Colic, paralysis, and ulcer, in their most frightful and obstinate forms, appeared in more than twenty cases; the health of all was much impaired, and one death ensued. Several cases lingered in a most wretched state, but the surgeon thought they would eventually recover.

In 1820 the number of deaths was 576; in 1821, 319; in 1822, 174; and in 1823, 194, with the causes of 38 per cent of them not reported for that year. The only diseases of which there was an appreciable decrease in the number of cases during 1823 as compared with the three preceding years were diarrhea and dysentery. For the three years, 1820-1822, the average number of cases of those complaints was 55, while in 1823 the number was 48, which perhaps accounts for the following official statement on the health of the Army for 1823:

The whole number of deaths reported during the last year was 194. The causes of 74 were not stated. Of the remainder, 31 were from bilious fever; 16 from dysentery; 20 from consumption; 10 from intoxication; 9 from typhus fever; and 6 from accidents. The remainder were from various and accidental causes. A result which, considering the various existing causes of diseases to which soldiers are necessarily exposed, gives ample proof of good police and discipline, as well as of the qualifications and efficiency of the several officers of the Medical Staff.

Notwithstanding how wide from the mark some of these assumptions were, there is much evidence that the pioneer army medical officers generally were very keen observers and recognized the sources from which many of the diseases sprang. For instance, they noted that when camps were moved from low, marshy locations to higher and dryer situations, the prevalent fevers were much less in evidence, and thus marked them as place-diseases; and that where unsanitary conditions existed dysentery prevailed.

*Hospitalization.*—Of real hospitalization there was none, but the following extracts should probably be placed under that heading:

1820. The complaints at Fort Mifflin evidently arose from the necessity of crowding the men during the winter season in barracks not calculated to accommodate above one-third the number; and from the want of suitable accommodations for the sick. The hospital, it is stated, scarcely admits of repair.

A report from Fort Scott, covering the period of three months mentioned that at the close of that period the number of men there was 578, the number of deaths 8, 1 of apoplexy and 1 of bleeding from the stomach. Of the 6 others, life was nearly exhausted on their arrival, and 5 or 6 more had died on the passage from Fort Gadsden, in consequence of being pent up for more than twenty days in a small vessel, and the greater part of that time without medical aid.

1821. Indifferent quarters and the want of tolerable accommodations for the sick (at Baton Rouge) have no doubt increased the number of diseases and added to their fatality.

1822. From St. Marks, Fla.:

My hospital is very bad and more or less wet at every rain. On the 16th of September the tide rose uncommonly high, which nearly inundated this place and the whole of the adjacent country; the water was a foot deep in the hospital; in fact I visited my sick and went through it in a canoe. The bunks were high, which keep the men out of the water, but this, as well as the wet from the rains, had a very injurious effect on my patients, particularly those laboring under dysenteries and diarrhoea. This place is generally damp, being all made ground.

The barracks of the men are of stone and very damp. We are compelled to use the river water which is not very good, and which is brought from about three miles above this in barrels. The police of the garrison is bad; when the tide is high the men are compelled to go through the water to the privy, which is very injurious, particularly to the sick.

Fort Scott has always been an unhealthy post, and the diseases appear to have been rendered more violent and fatal from the character of the men enlisted, and their irregular habits after their arrival there. About the 1st of October, and shortly after the seven companies of the 7th Regiment had left this post, there were 154 on the sick list, chiefly dysenteries, and most of the men were exceedingly enfeebled by previous disease. While descending the river and when encamped on a low piece of ground near its mouth they were for several days exposed to a violent storm of wind and rain; the sick list rapidly increased, *and nearly every man was complaining*. On the 9th they embarked for New Orleans, and no vessel having been provided for the sick they were stowed away with the baggage of their several companies, and were consequently without medical aid until their arrival, about the 17th, at the Bayou St. John, and they suffered exceedingly from the quality of their water, which had been put into filthy casks containing the lees of port and claret wine, and, tho' impure and offensive, was greedily drunk, and soon greatly increased the cases of dysentery and rendered them very fatal. A suitable house was here obtained in which between forty and fifty of the sick were put. On the 20th, they marched to about a mile above New Orleans, and the sick were put into a small and convenient house in the city, where they suffered from rain, the want of room, and of fuel, all which circumstances were often reported to the commanding officer.

While the troops were encamped here, another violent storm prevailed for four days, prostrated most of the tents, and inundated the ground. They remained at this place until the 6th of November, when they embarked for Forts Selden and Smith. The detachment for Fort Selden was on two steamboats so crowded with baggage that the sick could not be accommodated below, and several perished from cold and from exposure to the rain. During the day they kept themselves tolerably comfortable near the boilers, but the great change when the fires were extinguished at night produced several sudden deaths. After progressing a short way up the Red River, one of the boilers burst, killed three men and injured several more. The other boat arrived at Alexandria about the 14th of the month and the former about the 29th, by which time the water was so low that the steamboats could progress no farther. After a great deal of fatigue in changing the baggage, drawing the boats over the rocks, etc., they arrived near Fort Selden, about the 17th of December, having been upwards of two months and a half on the march. Not finding the barracks in a condition to be occupied they again encamped, and a house was obtained which accommodated about thirty of the sick. At the time of making the report, the first of January, all the men fit for duty were employed in building an hospital, and repairing the barracks. During the whole of the passage from New Orleans, to Fort

Selden, the weather was uncommonly cold and rainy; the men were constantly exposed both in the steam boats and the barges, where many of them died. About three-fourths of the cases were dysentery, succeeded or accompanied with intermittent, remittent, and typhus fevers. The detachment destined for Fort Smith was also much exposed to the cold and rain. There were 13 deaths, chiefly among the men from Fort Scott, and all from dysentery.

Too little attention is paid to the comfort and convenience of the sick, especially on the march. Whenever troops are transported by water, the sick are usually kept with their comrades, the vessels are crowded with baggage, and those who require all the comforts of an hospital are deprived of even a decent shelter from the inclemencies of the weather, as well as the attendance of the surgeons and the necessary supplies of medicines and stores. In all cases, such an arrangement should be made that the surgeon may be with those requiring his services, and have free access to his medicines and stores; and the vessel containing them should not be so entirely filled with baggage as to confine the sick both day and night to the deck, as is most generally the case. The subject of the transportation of the sick has very seldom met with the attention it deserves and absolutely requires.

1824. The surgeon at Baton Rouge reported that the want of a proper building for the reception of the sick, and the crowded state of the barracks (a mere shed) had rendered his duties peculiarly arduous and unpleasant. In touching on this report, the Surgeon General remarked: "The condition of the barracks and hospital has been reported before; and, as Dr. — does not complain without good cause, it is believed the subject requires early attention; and this opinion is confirmed by other statements received from other officers."

1826. The surgeon at Fort Monroe renewed application made by his predecessor for the erection of an hospital, and stated that the room in the company barracks at that time occupied by the sick was by no means calculated for their accommodation. He believed that a hospital was required at that place and thought that, if practicable, it should be completed before the sickly season commenced, both on account of the sick and those who might be employed in erecting the hospital.

1835. The Surgeon General reported to the Secretary of War as follows:

Many of the military posts are entirely destitute of suitable accommodations for the sick. A large portion of the buildings appropriated to that purpose have been erected a long time and were built of perishable materials in a hasty manner to meet the exigencies of the occasion, while at most of the works recently completed, no provision is made for the sick, who are necessarily placed in damp casemates, or in temporary buildings entirely unfit to protect them from the inclemencies

of the weather, or to preserve the property under the charge of the medical officers.

In closing, it might not be inappropriate to add that the troubles of the Medical Department were not confined entirely to the service in the field, as the following reports from the Surgeon General to the Secretary of War will attest:

1838. It becomes my duty to state to you, that the clerical duties appertaining to the Surgeon General's Office cannot be performed by one individual. When the office was first created and one clerk awarded to it, we had a small Army, with the troops more concentrated than now, a few medical officers, and a still less number of line physicians. Now our Army is larger, and the troops are much more dispersed over the country, a great accession has been made to the strength of the medical staff, and from the necessities growing out of the state of war, a still greater increase of line physicians is required. The correspondence *simply* of the department with these numerous physicians and with the officers of the line of the Army, not to mention that on public business with many persons in civil life, will give ample employment to the force now in the office. And if we take into consideration the various reports required from the office, and also the numerous returns, reports, etc., from the surgeons, assistant surgeons, and other physicians employed at the military posts, arsenals, recruiting rendezvous, etc., extended all over the lands, which have to be examined; adjusting, and finally settling the multiplicity of complex and perplex accounts which are constantly coming in upon the department, it will be evident that with the present force the business of the office cannot be properly done, if it is done at all. I am willing, and so is the clerk, to do all that other men can do. I am ready to undertake whatever man can accomplish; but I cannot perform impracticabilities; and one of these is to keep pace, with one clerk, with the continuously increasing business of the Medical Department of the Army.

This appeal evidently went unheeded, for in 1839 the Surgeon General again brought the subject to the attention of the Secretary of War with the following statement:

I have, within the past year, with the assistance of one or two medical officers, brought up almost all the back business which had for years, in consequence of the want of force in the office, been accumulating upon the department. I beg leave, in conclusion, to call your attention again to the fact that the services of another clerk are indispensable to this office. While I have the control of the department, I shall keep the business up, and if I cannot obtain the aid of a regular clerk, I must call into requisition the occasional services of one or more of the medical officers of the Army.



## THE CONTROL AND PREVENTION OF DIPHTHERIA IN THE U. S. ARMY

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IN THE fall of 1921 it was decided to test all members of the command at Camp Meade, Maryland, for susceptibility to diphtheria. This survey was undertaken not only for the purpose of identifying immune and non-immune individuals but as a step toward the artificial immunization of those not found to possess natural resistance to the disease. In other words, we wished to ascertain how far it might be practical to apply modern methods toward the eradication of diphtheria from the Army.

During the winter months of 1920-21, at this camp with approximately 5,500 troops, there were 82 cases of the disease, with a loss of 2,296 days. Added to this there was a loss of 8,400 days due to isolation of contacts and carriers. While these figures cannot be used in estimating the incidence of the disease in the Army as a whole, they do show the loss to the service and annoyance this disease may cause in an army camp. This year to date (February, 1922), but two cases have developed among approximately 2,400 soldiers. In comparison with this, the U. S. P. H. reports show that during the first nine months of 1921, in forty-two states submitting reports, the increase of the disease was 53 per cent over the mean for the last eight years. The following totals given in the report appearing in Public Health Reports for October 28, 1921, show the prevalence of this disease:

	January	Feb.	March	April	May	June	July	August	Sept.	Total
<i>Total:</i>										
1921.....	17,885	14,858	13,232	11,312	10,807	9,662	7,532	10,034	.....	.....
Median .....	10,950	8,656	8,699	7,553	7,640	6,845	6,000	5,997	9,176	71,516
<i>Annual rate per</i>										
100,000: 1921	235	196	174	149	142	127	99	132	.....	.....
Median .....	152	120	121	105	106	95	83	83	128	110

These statistics show that the incidence of diphtheria in civil communities is not diminishing; furthermore; the number of cases resulting fatally has not been reduced below somewhat more than 10 per cent. The death rate of diphtheria is nearly equal to that of measles and scarlet fever combined. Yet more is known concerning the cause and prevention of diphtheria than of any other infectious disease, and in diphtheria antitoxin we have a specific and efficacious therapeutic and prophylactic agent which is used almost universally. That the

death rate is practically stationary is illustrated by the following table, from Public Health Reports, January 13, 1922:

DIPHTHERIA DEATH RATES PER 100,000 POPULATION IN REGISTRATION AREA FOR DEATHS 1913-1920, INCLUSIVE

1920	15.3	1915	15.7
1919	14.7	1914	17.9
1918	13.9	1913	18.9
1917	16.6		
1916	14.5	Median	15.5

*Authority.*—As the Schick test was to be made on a larger scale than heretofore in the Army, it was necessary first to acquaint the authorities and the line with the nature of the test and its desirability. The camp surgeon took the matter up officially with the commanding general of the third corps area, through the corps area surgeon, and it was recommended through that office that the entire command be tested. The line cooperated wholeheartedly in this project, and the testing was begun during the first week of November, 1921. In all about 2,200 individuals were tested, but due to transfers, etc., complete records were obtained on only 1,887 individuals. The work is still being carried on by the organization surgeons, so that a record will be obtained for all personnel in this camp at present and for all recruits.

The actual work of testing the men and making the readings is not great. Four medical officers with assistants can easily inject about 1,000 each day. The difficulty is getting all stragglers and special detail men to appear at the designated times for the test and readings.

*The Schick Test.*—The Schick test provides a means of determining whether or not individuals are susceptible to diphtheria. The reaction depends upon the fact that, if 1/50 M. L. D. (for 250 gm. guinea-pig) of diphtheria toxin is injected intracutaneously into an individual with sufficient antitoxin in his blood (at least 1/30 unit per c.c. of blood), it does not produce a reaction in the skin. In event of a deficiency or absence of the minimum protective antitoxin in the blood, there will be a sufficient excess of toxin to produce local reaction; upon this reaction the Schick test is based.

Perhaps the most striking example of the reliability of the Schick test is that cited by Park. Among 2,200 scarlet fever cases with negative Schick reactions, none of whom received immunizing doses of either antitoxin or toxin-antitoxin, not a single case developed diphtheria, although 20 to 25 per cent subsequently became carriers of virulent diphtheria bacilli. That it is not an absolute index of susceptibility, however, has been pointed out by this worker and others, for while a negative reaction indicates that an individual is immune to constitutional diphtheria, a positive reaction does not necessarily mean that



one will contract the disease upon exposure. The antitoxic immunity is not the sole factor of protection; the bactericidal powers of the blood and tissues also play a rôle. Spontaneous recovery from the disease is due to this latter factor and not to the production of antitoxin by the patient's own cells. This latter factor, however, plays a minor rôle, and, as we have no means of determining which of the positive reactions will be immune, it can be disregarded in the work of active immunization. This bactericidal immunity also helps to explain why some healthy carriers with positive Schick reactions do not develop the disease. The following interesting table from a recent article by Guthrie, Marshall and Moss shows the results of the Schick reaction in healthy and convalescent carriers and in individuals who have recovered spontaneously from diphtheria:

RESULTS OF SCHICK TESTS

Observer	In convalescent carriers of virulent organisms	In healthy carriers of non-virulent organisms	In healthy carriers of virulent organisms	After spontaneous recovery from diphtheria
Kolmer.....	Pos. or neg.	Pos. or neg.	Negative	.....
Park.....	Pos. or neg.	Pos. or neg.	2 <sup>1</sup>	Pos. or neg.
Place.....	Pos. or neg.	Pos. or neg.	Negative	Pos. or neg.
Guthrie, Marshall and Moss.....	Pos. or neg.	Pos. or neg.	Negative	Pos. or neg.

*Organization.*—The companies reported to the laboratory at an appointed time. Here they were lined up alphabetically, corresponding to the rosters, which were presented by the company commander in duplicate to the officer charged with making the tests. After entering the laboratory two lines were formed, the men presenting themselves, with both sleeves rolled above the elbows, to one of the two teams making the injection. A team consisted of two medical officers and two enlisted attendants. The site of injection, the upper third of the flexor surface of the forearm, was wiped clean with a sponge wet with 95 per cent alcohol. One medical officer made the test injection into the right forearm, while the second made a control injection into the left forearm.

The room used had a through-and-through passageway, and the men, after receiving the two injections, passed across the room and were checked off their roster (the date of test being entered after each name). After being checked the men left the laboratory by the opposite door, thus avoiding confusion and ensuring expedition. The roster

<sup>1</sup>Data insufficient, but Park says he knows that a few are Schick positive.

form was prepared on a mimeograph and distributed to all organizations (see Fig. 1.).

FIG. 1.

Name and rank	Organization	Date of test	First reading	Second reading	Final result

*Technique.*—The small Schick test outfit prepared by the New York Board of Health was used in this work and so diluted that 0.2 c.c. of the mixture represented 1/50 M. L. D. for a guinea-pig of 250 gms. weight. A similar dilution of the toxin heated to 75° C. for five minutes was used for the control injection.

A 1-c.c. tuberculin syringe with ½-inch, 25-gauge steel needle was used in making the injections. The needles should be sharp, with short bevel and free from rust. The needles were not changed between injections but were cleansed by wiping thoroughly with a sponge saturated with 95 per cent alcohol. In our series of 2,200 tests no skin infections were observed. These results correspond with those reported by Zingher in testing a large number of children in the New York Public Schools, and we believe this technique to be free from any objection, inasmuch as the needle is inserted into the layers of the skin and not beneath it.

*Recording Results.*—The method of reading was that followed by Park and his coworkers. For the sake of brevity and convenience in entering results, we adopted the following symbols:

- ++.....positive reaction.
- + .....positive-combined reaction.
- (+—)..... pseudo-negative reaction.
- (—).....negative reaction.

The literature describes fully the positive, pseudo-negative and negative reactions but gives little concerning the positive-combined reaction, first noted by Park. This reaction consists of a pseudo-reaction on the control side with a positive reaction superimposed on a pseudo-reaction on the test side. Some difficulty is encountered in distinguishing these two reactions at forty-eight hours, but with a little experience they may be easily differentiated at a later reading. The positive and positive-combined reactions indicate susceptibility, while the pseudo-negative and negative reactions indicate immunity to diphtheria.

From our experience, it is our conviction that the ideal periods for reading the reactions are forty-eight hours and five days after injection. However, in a military establishment, we feel that periods of forty-eight hours and one week give highly satisfactory results, and they were decided upon by us because they were more definite and convenient and permitted us to carry the experiment through to a satisfactory conclusion with but little inconvenience and interruption to the routine duties of the organization and the soldier. It has been our experience that the twenty-four-hour reading is of little value.

When completed, a copy of the rosters was returned to the organization surgeons, who supervised the entry of the results in the soldier's service record.

*Results Obtained.*—In this series of 1887 reactions, the following results were obtained (Table I)

TABLE I

	Negative	Pseudo-reaction	Positive-combined	Positive
Total number. . . . .	1094	354	206	233
Per cent of total. . . . .	58	18.8	10.9	12.3

The following table gives the percentage of susceptibles and non-susceptibles according to age groups:

TABLE II

Age. . . . .	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54
Susceptible. . . . .	20	22.5	24	25.2	12.3	22.5	19.3	16.6
Non-susceptible. . . . .	80	77.5	76	74.8	87.7	77.5	80.7	83.4

Of the 1,483 cases in which ages were ascertained, 1,031 fell in the age group 20 to 29 years, and while even this group is not large enough to establish a true percentage of immunes and non-immunes, it does indicate fairly accurately what proportion of the enlisted strength of the Army, and particularly of the recruits, may be expected to be susceptible to diphtheria.

In the reading of the reactions it was our aim to err always on the side of safety—that is, any doubtful positive was called positive, any doubtful pseudo-negative was called positive combined, and any doubtful positive combined called pseudo-negative. This gave us possibly

a somewhat higher percentage of susceptibles, but for the purpose of immunization we deem it the wiser method. Our percentage of pseudo-reactions was only 18.8 per cent as compared with the figures of others which gives the percentage of this group of reactors as 38 per cent or higher. Even if combined with the positive combined reactions, which has undoubtedly been done in some cases, the total would be only 29.7 per cent.

*Discussion of the Schick Test.*—The following table taken from Park shows the susceptibility in all age groups:

TABLE III.—SUSCEPTIBILITY IN VARIOUS AGES

	<i>Per cent</i>
Under 3 months.....	15
3 to 6 months.....	30
6 months to 1 year.....	60
1 to 2 years.....	60
2 to 3 years.....	60
3 to 5 years.....	40
5 to 10 years.....	30
10 to 20 years.....	20
Over 20 years.....	15

Major Michie, with the American forces in Germany, made the Schick test on 582 persons of all ages (officers, nurses and enlisted men). He found 33.64 per cent positive and 6.71 per cent questionable reactions which he considered as positives for purposes of immunization. In a series of about 9,000 cases, Norwood, working with navy recruits, found slightly over 14 per cent positive. The difference between the figures of this latter worker and ours can probably be largely accounted for by the fact that we read all doubtful positives as positive.

*Immunization.*—It was our original purpose to immunize all susceptibles with toxin-antitoxin as carried out by Park and others with such excellent results, but it was deemed impracticable at this time. However, we feel that the completing of the Schick reaction on this number of individuals has been of value in establishing the number of susceptibles and that, in the event of the outbreak of an epidemic, our records will be of great value as a measure of control in preventing the spread of the disease.

Norwood immunized all susceptibles among 9,000 individuals Schick-tested. He gave three injections of 1 mil each of N. Y. B. of H. toxin-antitoxin at weekly intervals with no untoward results. In a small number of cases the reaction resembled that following typhoid inoculation. Less than 5 per cent of the total immunized required bed treat-

ment. The total number of reactions, which included mild symptoms as headache, malaise and low temperature, but not requiring bed treatment, was 8 per cent. He recommended that all officers and men under fifty years of age in the U. S. Navy be tested and all susceptibles immunized with toxin-antitoxin. At Girard College, Philadelphia, 544 of a total of 1,600 boys (aet. 6 to 16 years) received toxin-antitoxin. The reactions were not severe, none as severe as many following vaccination against smallpox.

*Discussion of Active Immunization.*—Since the percentage of susceptible adults is small as compared with children and the results obtained from injections of toxin-antitoxin are not so important, Park advises against the immunization of adults because of the severe reactions occasionally encountered. However, we agree with Hitchens that the problem in the Army is quite different to that of civil life and should be met along line similar to that in which Park and his coworkers have been handling outbreaks of the disease in institutions for children, schools, hospitals, etc.

Among children the problem of dosage is comparatively a simple one, no reactions, or at the most very slight ones, being observed after 1 c.c. of toxin-antitoxin. Among adults this problem is more difficult; those individuals giving well-marked positive reactions usually show little or no reaction following the injection of 1 c.c. of toxin-antitoxin at weekly intervals, while those who have positive combined reactions frequently develop considerable local and constitutional disturbance, even with a much smaller dosage. In nineteen individuals to whom we administered toxin-antitoxin only three gave any reaction—two with frankly positive reactions following the injection of 0.5 and 1.0 c.c., and one with a positive combined reaction following the administration of 0.2 c.c. Park has noted that his positive combined cases frequently give severe reactions. When he reduced the dosage from 1.0 c.c. to 0.2 c.c. there was slight reaction with as good immunization results. We would suggest that, in cases of positive combined reactions, the initial injection contain not more than  $1/20$  c.c. of toxin-antitoxin. This, however, may be increased at subsequent weekly injections, the size of the dose being gauged by the reactions. Six or eight injections of relatively small dosage, given at weekly intervals, may be necessary to establish immunity.

The immunity conferred by toxin-antitoxin was found by Park to have persisted over a period of five years after immunization in more than 90 per cent of individuals immunized in a series of 5,000 cases observed. Other observers in this country have found that the immunity has lasted during their period of observation, which has not been as

long as that of Park and Zingher. These observations indicate fairly strongly that immunity, once established, remains permanent. Two French observers, on the other hand, believe that it lasts only one and one-half to two years, but the work of the American observers is much more encouraging.

*Conclusions and Recommendations.*—Diphtheria is a disease having a mortality of about 10 per cent and causes a great loss to the service from days lost due to hospitalization and isolation of contacts and carriers. A means has been definitely established for differentiating the susceptibles from the immunes, and an agent is at hand whereby a definite and enduring immunity may be conferred on the susceptible individuals. We feel that this disease can be made to entirely disappear in a short period of time from the Army. In view of these facts the following recommendations are made:

1. That all officers and enlisted men in the U. S. Army, together with all civilians under military jurisdiction, under 50 years of age, be required to submit to the Schick test and, if found susceptible to diphtheria, that they be immunized by injections of toxin-antitoxin.

2. That medical officers on recruiting duty be instructed in the technique of the Schick test and its proper interpretation.

3. That in the case of positive combined (+) reactions, the individual receive not more than 1/20 c.c. of toxin-antitoxin as an initial dose, that the dosage for subsequent injections be gradually increased dependent on the severity of reaction, and that from six to eight injections be given individuals in this group.

4. That results of the first and subsequent Schick reactions and date of immunization be entered on the individual service record of the soldier.

5. That the most favorable times for reading the reactions are forty-eight hours and one week after injection.

#### BIBLIOGRAPHY

- Schick, B.: Munch. Med. Wochsch., 1913, 60, 2,608.  
 Park, W. H.: Amer. Journ. of Obs. 1913, lxxviii, 6, 1,213; Transactions Assoc. of Amer. Physicians, 1918, xxxiii, 55. Nelson's Loose Leaf Living Medicine, Vol. I.  
 Park, W. H. and Zingher, A.: Jour. of Immunology, 1916, i, No. 1, 127; Med. Rec. N. Y., 1916, Vol. 90, No. 17; Med. Rec. N. Y., 1918, xciv, No. 14, 615.  
 Zingher, A.: Amer. Journ. Dis. Children, 1918, xvi, No. 2, 83.  
 Von Behring, E.: Verhandlungen des Kongresses für innere Medizin. 31 Kongress, 1914.  
 Norwood, B. F., Lieut., M. C., U. S. N.: U. S. Nav. Med. Bul. 1921, xv, No. 2, 485.  
 Zingher, A.: Med. Rec. N. Y., 1919, xcvi, No. 11, 462.  
 Gorter E. and Ten Bokkel Huinink: A. Arch. de Med. des Enf., 1920, 23, No. 6, 338.  
 Blum, J.: Amer. Journ. Des. Child., 1920, 20, 22.

- Blau, Arthur J.: *New York Med. Journ.*, 1920, cxii, No. 9, 279.
- Guthrie, C. G., Marshall, B. C., and Moss, W. L.: *Bul. Johns Hopkins Hosp.*, December, 1921, Vol. xxxii, No. 370.
- Opitz, H.: *Jahr. für Kinderheilkunde*, Berlin, 1921, Vol. 96, Nos. 1 and 2, p. 19.
- White, Benjamin: *Boston Med. and Surg. Jour.*, 1921, 184, No. 10, 246.
- Bauer, E. L.: *Penn. Med. and Surg. Journ.*, 1921, Vol. xxiv, 471; *The Therapeutic Gazette*, Detroit, 1920, xxxvi, No. 7, 457.
- Ghown, Gordon: *The Canadian Med. Asso. Jour.*, 1921, xi, No. 5, 319.
- Hitchens, A. Parker: *Kentucky Med. Jour.*, 1921, xix, No. 5, 240.
- U. S. Public Health Reports, Vol. 36, No. 43, October 28, 1921, page 2686.
- Zingher, A.: *Arch. Ped.*, 1918, Vol. 35, 489-494; *Journ. Lab. and Clin. Med.*, 1920, Vol. vi, No. 3, 1; *J. A. M. A.*, 1920, Vol. 75, No. 20, 1,333; *J. A. M. A.*, 1921, Vol. 77, No. 11, 835.
- Michie, H. C., Maj., M. C., U. S. A.: *Medico-Military Rev.* 1921, Vol. v, No. 6, 62.
- Park, W. H.: *Med. Clin. of N. Amer.*, 1918, Vol. 2, No. 1, 31.
- Park, W. H., and Zingher, A.: *J. A. M. A.*, 1915, lxx, No. 26, 2,216.
- Hitchens, A. Parker: *Medico-Military Rev.*, 1921, Vol. v, No. 12, p. 148.



## THE ETIOLOGY OF SCURVY<sup>1</sup>

### IV. OBSERVATIONS CONCERNING THE PHYSIOLOGIC ACTION OF THE ANTISCORBUTIC VITALIMENT

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(With eight charts)

THE physiologic action of the different vitaliments has remained a mystery. We do not understand how such profound anatomic changes as exist in scurvy and beriberi can be brought about by the deficiency of such relatively small constituents of the diet. Yet it is completely demonstrated by the experimental evidence that such is the case.

We have been taught for many years that glucose is consumed in the body with the production of water and carbon dioxide. This seems very simple and satisfactory until we learn that this combustion cannot occur without the action of an internal secretion of the pancreas, concerning whose chemical constitution and action little or nothing is known. It is plain that at present we must admit we know very little concerning the chemical processes concerned in metabolism, and we cannot deny the absolute necessity of the vitaliments in the diet merely because we cannot explain their function. The following experiments were performed to obtain some clue to the physiologic action of the antiscorbutic vitaliment.

One of the first possibilities that suggests itself is that the vitaliment may be concerned in some manner in the elaboration of an internal secretion. The adrenal glands are enlarged and hemorrhagic in scurvy. Is there an alteration of the adrenal secretion? The changes in the bones in scurvy have been often described. There is a marked tendency for certain bones to be affected, notably the extremities of the long bones, and the jaws and ribs. It is known that the pituitary secretion in some way controls the growth of the skeleton. Is it possible that some deficiency or alteration of the pituitary secretion brings about the pathologic changes in the bones in scurvy?

It seemed that, if the changes found in scurvy were caused by the deficiency or alteration of one of the internal secretions, these changes could be prevented by supplying the animal with a sufficient amount of normal secretion. And since it is known that, whatever the vitaliment may be, it is normally supplied in the diet, it was decided to supply

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the internal secretion in the same way. The following experiment was performed to determine the effect of supplying adrenalin.

*Experiment 16.*—A guinea-pig weighing 218 grams was placed on the scurvy-producing diet and given in addition a daily dose of two drops of a fresh preparation of adrenalin—1-1000, prepared by Parke Davis Co. This guinea-pig developed typical symptoms of scurvy in fifteen days and was later cured by the administration of an extract of orange juice. From this it may be concluded that adrenalin is unable to prevent the symptoms of scurvy. The dose was relatively large for so small an animal, and the depletion period was not even prolonged. The feeding of hydrochinon and pyrocatechin, two compounds very similar to adrenalin in chemical structure, also failed to prevent the development of scurvy in guinea-pigs.

*Experiment 17.*—To determine the effect of feeding pituitary secretion, a guinea-pig weighing 264 grams was placed on the scurvy-producing diet and given in addition the pituitary gland from a freshly slaughtered calf. The gland was minced and fed so that the guinea-pig received a whole pituitary gland every four or five days. This guinea-pig developed scurvy in the usual time and died of scurvy on the twenty-fifth day. Another guinea-pig of 327 grams received a daily dose of a two-grain tablet of anterior pituitary prepared by Armour and Co. and representing 10 grains of fresh pituitary substance. This guinea-pig developed scurvy in twenty days. The feeding of the obstetrical pituitrin prepared by Parke Davis Co., presumably from the posterior portion of the gland, also failed to prevent the development of scurvy in doses of  $\frac{1}{2}$  c.c. daily. Therefore neither the whole pituitary gland nor extracts of either portion were capable of preventing the development of scurvy.

*Experiment 18.*—To test the effect of administering thyroid extract, a guinea-pig of 327 grams was placed on the scurvy-producing diet and given in addition a daily dose of a tablet of thyroid prepared by Armour and Co. Each tablet represents one grain of dessicated thyroid, containing 0.2 per cent of iodine in thyroid combination, and the daily dose for a man suffering from thyroid deficiency is stated to be from 3 to 12 tablets daily. In proportion to weight, the guinea-pig received at least 600 times the dose required by man. Yet this large dose of thyroid failed to prevent or delay the onset of scurvy and also failed to cure the disease after it had appeared.

There are other internal secretions, notably those of the pancreas, sexual glands and parathyroids. But it appears improbable that defect in the secretion of any of these glands could produce scurvy. There is certainly no evidence indicating that deficiency of any of the internal secretions is the cause of scurvy.

The antiscorbutic vitaliment is taken into the body in the food, but nothing is known as to what becomes of it. It is natural to suppose that it must enter the blood stream before it can be utilized. The following experiment was therefore undertaken to demonstrate the presence of the antiscorbutic vitaliment in the blood.

*Experiment 19.*—A guinea-pig weighing 230 grams was placed on the scurvy-producing diet and given in addition a daily dose of 2 c.c. of serum obtained from normal guinea-pigs that received a bountiful supply of green food. The serum used was obtained at the same time as that used for complement in the Wassermann reaction, and was drawn on Mondays and Thursdays and kept in the ice-box during the intervening days. This guinea-pig developed scurvy in twelve days. The experiment was repeated, using 2 c.c. of rabbit serum daily, with similar results.

It may be computed that a guinea-pig of this weight will contain not more than 20 c.c. of blood or 10 c.c. of blood serum in which the antiscorbutic vitaliment could be dissolved. A daily dose of 2 c.c. of serum is therefore approximately one-fifth of the entire amount of serum contained in a guinea-pig of this size. The conclusion seems justified that the antiscorbutic vitaliment is not present in the peripheral circulation. Is it excreted unchanged? The following experiments were performed to test this possibility:

*Experiment 20.*—The urine of a man who consumed a large amount of citrus fruit was evaporated to dryness and extracted with an equal amount of alcohol. The alcoholic extract was evaporated to dryness and the residue redissolved in water. This method was used because guinea-pigs cannot be fed untreated urine without deranging their digestive function. A guinea-pig was placed on the scurvy-producing diet and given in addition a daily dose of this extract equivalent to 5 c.c. of urine. This guinea-pig developed scurvy in eighteen days. From this experiment it appears that the antiscorbutic vitaliment is not eliminated unchanged in the urine. Had any vitaliment been present, the depletion period should have been prolonged.

*Experiment 21.*—A guinea-pig was selected that was protected from scurvy by its diet, and its feces were collected. The weighed feces were extracted with alcohol, the alcoholic extract evaporated to dryness, and the residue dissolved in water. A guinea-pig was placed on the scurvy-producing diet and given a daily dose of this extract equivalent to 5 grams of feces. This animal lost weight progressively and was not protected from scurvy.

The antiscorbutic vitaliment is not present in the circulating blood and is not excreted as such. Is it used up in the metabolic processes, or is it a constituent of the tissues of the body? The following experiments were performed to determine this question.

*Experiment 22.*—A guinea-pig was placed on the scurvy-producing diet and given in addition a daily dose of 3 c.c. of a 10 per cent suspension in salt solution of guinea-pig erythrocytes. This guinea-pig developed scurvy in fourteen days and died of scurvy in thirty days. The experiment was repeated, using human washed corpuscles in place of guinea-pig corpuscles and finally giving 5 c.c. of beef corpuscles daily, with a similar result. Repeated blood examinations showed that

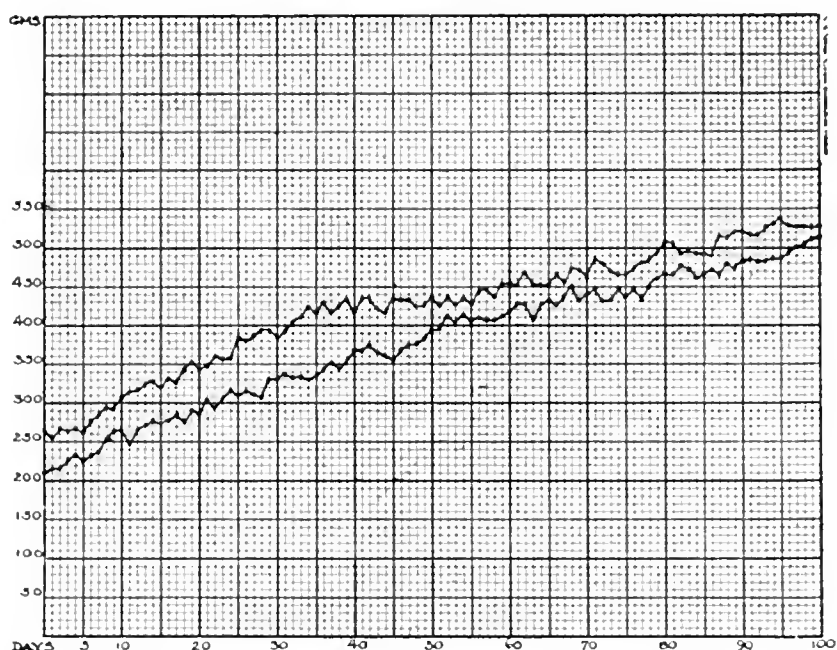


CHART 18.—Upper line, guinea pig receiving 5 grams calves' liver daily. Lower line, guinea pig receiving 2 grams calves' liver daily.

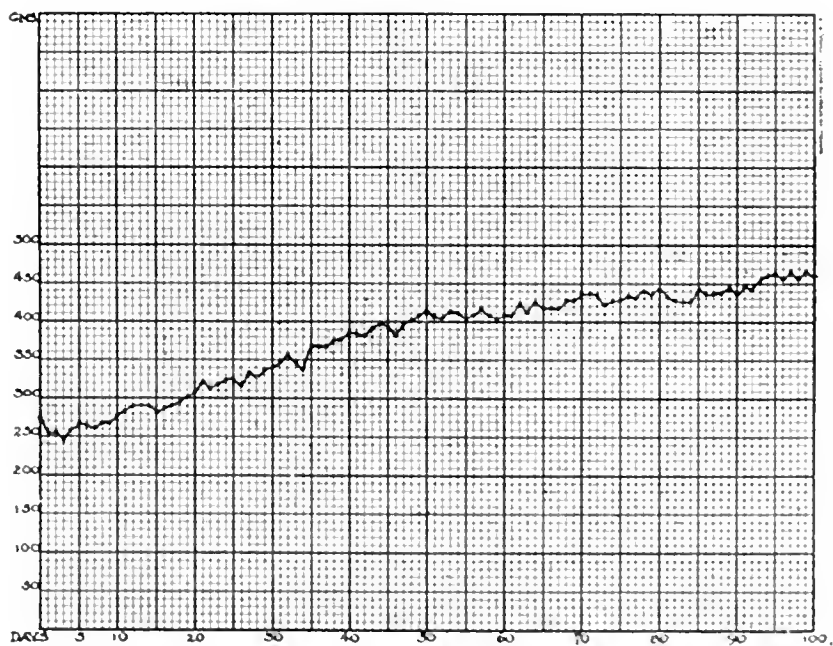


CHART 19.—Guinea-pig receiving 1 gram of calves liver daily.

these pigs suffered from anemia and films showed many nucleated red cells. This amount of red blood corpuscles will neither prevent or cure scurvy in the guinea-pig.

Anemia is one of the symptoms of scurvy, and this might result from an insufficient supply of some ingredient in the diet necessary for the function of erythrocytes. However, this hypothesis of the action of the antiscorbutic vitaliment is disproved by this experiment provided sufficient corpuscles were provided in the diet to make up the daily demand for the formation of new corpuscles. Ashby (1) has shown that the life of a transfused corpuscle is thirty days or more. If the life of a corpuscle is thirty days, then one-thirtieth of the entire number of corpuscles must be regenerated daily. A guinea-pig of 220 grams contains about 20 c.c. of blood, of which 10 c.c. are corpuscles. In the final experiment 5 c.c. packed corpuscles were fed daily. The fact that this large amount did not prevent scurvy or its symptom anemia is conclusive proof that the antiscorbutic vitaliment is not a constituent of the erythrocyte.

*Experiment 23.*—The bones of freshly killed guinea-pigs were thoroughly ground up in a mortar, adding a little water until a thick paste was produced. The bones used included those of the limbs, the lower jaw and the ribs, which are the bones most affected by the scorbutic process. Two guinea-pigs were placed on the scurvy-producing diet and given in addition 2 grams daily of this bone paste. These guinea-pigs both developed scurvy in the usual time. The antiscorbutic vitaliment is therefore not present in demonstrable amount in the quantity of bone fed. It was not practicable to feed larger amounts.

*Experiment 24.*—A guinea-pig was placed on the scurvy-producing diet and given a daily dose of 5 grams of beef muscle obtained from round steak. This guinea-pig developed scurvy in thirteen days. This is in accordance with the findings of Dutcher, Pierson, and Biester (2) and Givens and McClugage (3) who found that neither the raw lean beef nor beef juice possessed antiscorbutic properties.

*Experiment 25.*—A guinea-pig was placed on the scurvy-producing diet and given a daily dose of 5 grams of beef heart muscle, which was obtained from freshly slaughtered animals. This guinea-pig also developed scurvy in thirteen days. We may conclude from this that heart muscle contains little or no antiscorbutic vitaliment, since the depletion period was not even prolonged.

*Experiment 26.*—A guinea-pig was placed on the scurvy-producing diet and given a daily dose of 5 grams of calves' liver from freshly slaughtered animals. This guinea-pig lived and grew normally for 100 days, when the experiment was discontinued. Since 5 grams of liver afforded complete protection from scurvy, smaller amounts were fed to determine the minimum protecting dose. One guinea-pig receiving the scurvy-producing diet was given 2 grams of liver daily and one guinea-pig received but 1 gram daily. These pigs grew normally for 100 days, when the experiment was discontinued. (See Charts

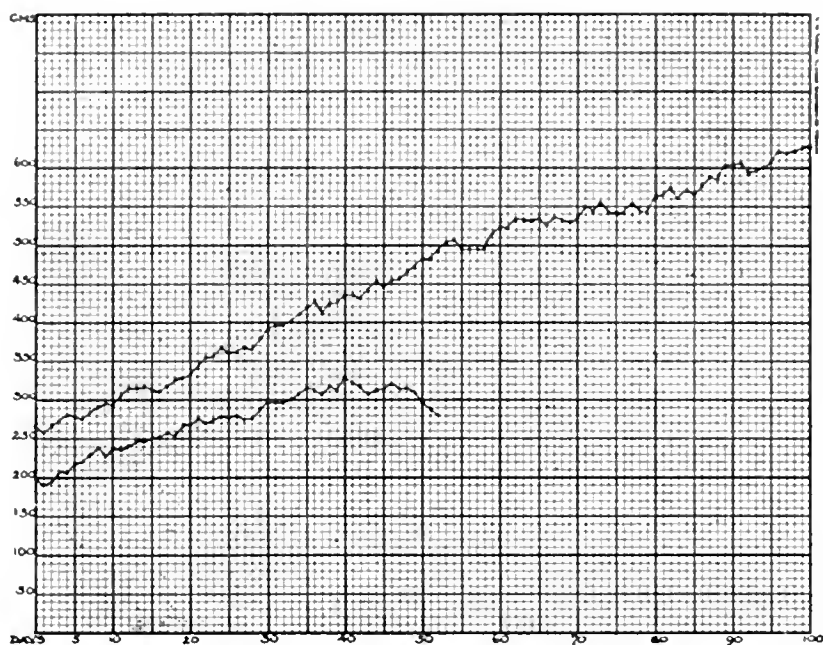


CHART 20 — Upper line, guinea-pig receiving 5 grams kidney daily. Lower line, guinea pig receiving 2 grams kidney daily.

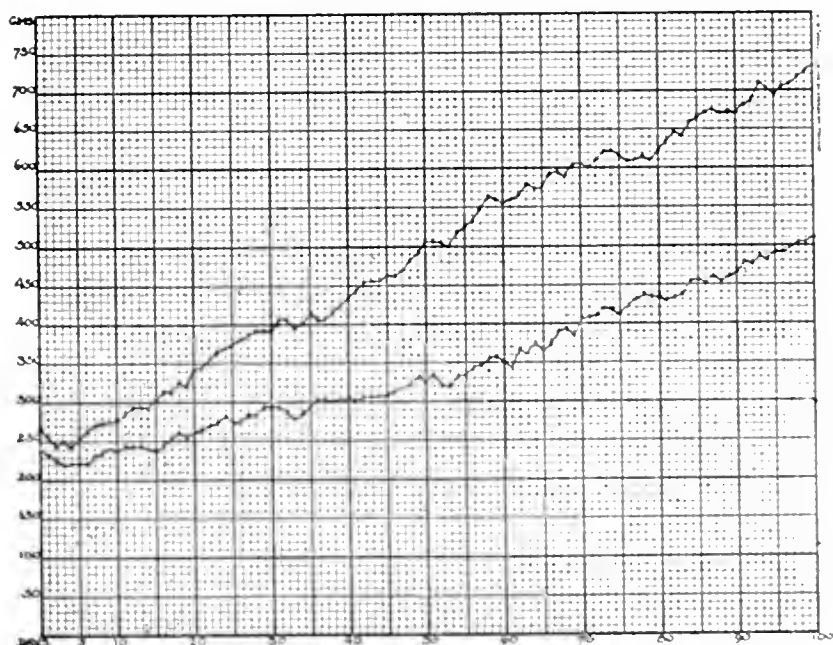


CHART 21. Upper line, guinea pig receiving 5 grams of lung daily. Lower line, guinea-pig receiving 2 grams of lung daily.

18 and 19.) It is therefore shown that beef liver contains the antiscorbutic vitaliment in considerable amount, inasmuch as only 1 gram daily will prevent scurvy in guinea-pigs. Liver therefore contains as much antiscorbutic vitaliment as cabbage and more than orange and lemon juice.

*Experiment 27.*—Two guinea-pigs were placed on the scurvy-producing diet and one was given in addition 5 grams daily of fresh beef kidney and the second was given 2 grams of beef kidney. The guinea-pig receiving 5 grams was fully protected from scurvy and grew normally for 100 days, when the experiment was discontinued. However, the guinea-pig receiving two grams of kidney developed scurvy after fifty days of feeding, and the experiment was discontinued. The amount of antiscorbutic vitaliment in 2 grams of kidney is insufficient to afford complete protection, although the depletion period was considerably prolonged. (See Chart 20.)

*Experiment 28.*—Two guinea-pigs were placed on the scurvy-producing diet. One was given in addition a daily dose of 5 grams of fresh beef lung, and the other was given 2 grams of fresh beef lung. Both of these pigs were protected from scurvy and grew normally for 100 days, when the experiment was discontinued. It is, however, noticeable that growth was much less rapid in the guinea-pig receiving the smaller amount. (See Chart 21.)

*Experiment 29.*—Two guinea-pigs were placed on the scurvy-producing diet. One was given in addition a daily dose of 5 grams of fresh beef spleen, and the second received 2 grams of the same spleen daily. Both of these pigs were fully protected from scurvy and grew for 100 days, when the experiment was discontinued. Growth was very pronounced in the guinea-pig receiving the larger amount. (See Chart 22.)

*Experiment 30.*—A guinea-pig was placed on the scurvy-producing diet and was given in addition a daily dose of 5 grams of thymus gland from freshly slaughtered calves. This guinea-pig was protected from scurvy for 100 days. For some unexplained reason, it failed to grow for nearly fifty days, but for the last fifty days it grew well. (See Chart 23.)

*Experiment 31.*—A guinea-pig was placed on the scurvy-producing diet and given in addition a daily dose of 5 grams of pancreas from freshly slaughtered calves. This guinea-pig grew normally and was protected from scurvy for 100 days. (See Chart 24.)

*Experiment 32.*—A guinea-pig was placed on the scurvy-producing diet and given in addition a daily dose of 5 grams of calves' brains. This guinea-pig was protected from scurvy for 100 days but growth was only moderate during this period. (See Chart 25.)

#### CONCLUSIONS

1. Scurvy is not caused by deficiency of the internal secretion of the thyroid, adrenals or pituitary glands, and there is no evidence that it is caused by deficiency of any internal secretion.

2. The antiscorbutic vitaliment is not present in the circulating

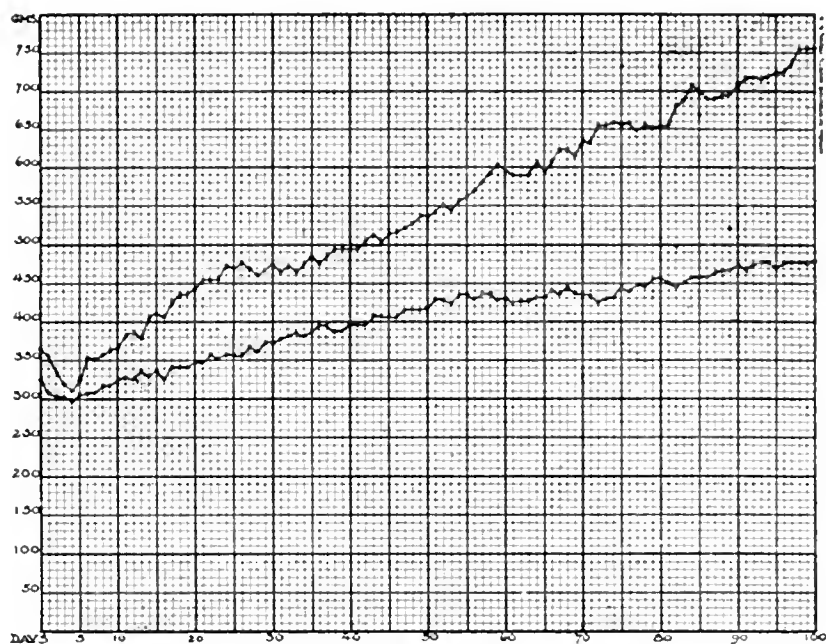


CHART 22.—Upper line, guinea-pig receiving 5 grams spleen daily. Lower line, guinea-pig receiving 2 grams of spleen daily.

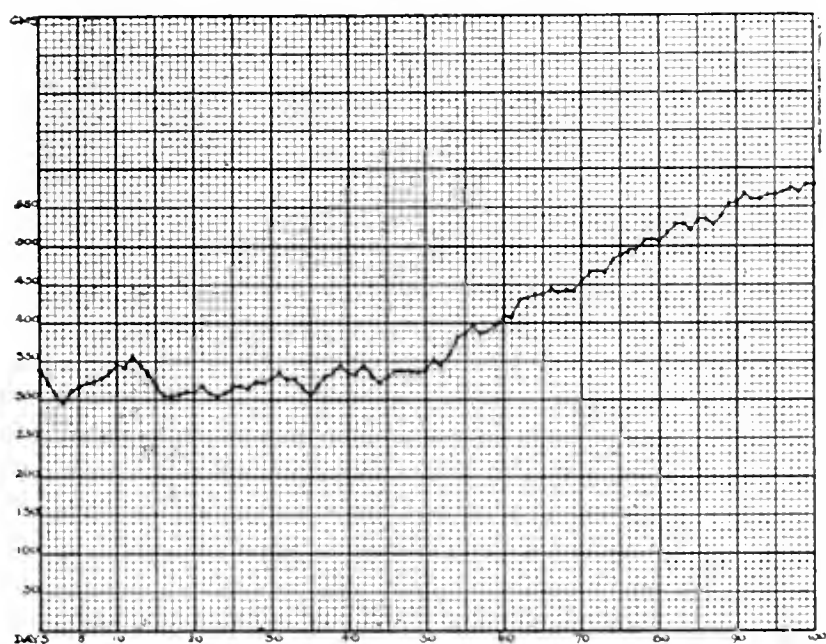


CHART 23—Guinea pig receiving 5 grams thymus gland daily

blood, and its presence cannot be demonstrated in the urine or feces of normal animals.

3. The administration of considerable amounts of erythrocytes, voluntary muscle, heart muscle and bone all failed to prevent the development of scurvy or even to prolong the depletion period. The antiscorbutic vitaliment is not present in these tissues in appreciable quantity.

4. The daily administration of 5 grams of either fresh liver, kidney, lung, spleen, pancreas, thymus, or brain protected guinea-pigs completely from scurvy for 100 days. All of these organs, with the possible exception of thymus and brain, also caused normal growth.

5. The daily administration of 2 grams of liver, lung, or spleen, or of 1 gram of liver protected guinea-pigs completely from scurvy for 100 days. Two guinea-pigs receiving 2 grams of kidney both developed scurvy after a depletion period of fifty days.

6. The antiscorbutic vitaliment is present in considerable amount in the liver, lung, spleen, kidney, pancreas, thymus and brain.

7. There is no evidence that the antiscorbutic vitaliment is stored in the body as such. All the evidence indicates that it is not so stored.

8. If the antiscorbutic vitaliment is present in these tissues and is not stored as such, it must form a component part of these tissues.

#### DISCUSSION

The observations here recorded are of some practical importance. It has been known for some time that meat, at least in the amounts that can be fed guinea-pigs, will not prevent scurvy. At the same time there are many observations indicating that a meat diet not only prevents but actually cures human scurvy. In this category we may place the observations of Stefansson (4) in which three cases of scurvy improved after eating frozen and partially spoiled meat. It is quite possible that in such cases the distinction between eating the meat and the glandular organs such as liver and kidneys has not been made and that this accounts for the discrepancy. All natives who live chiefly on a meat diet esteem the organs as dietary tit bits. When the plains Indian had been without game over a considerable period, he was accustomed to open the fresh killed bison and eat handfulls of raw liver. It is stated that the Esquimaux make a special effort to secure the liver of the seal, and that when hunters had Apache Indians as guides, the usual bargain was for the guides to take all the insides of the deer, leaving the meat for the hunters. It has been shown here that practically all the glandular organs are potent antiscorbutics. These customs are now susceptible of a plausible explanation, and the information may be of consider-



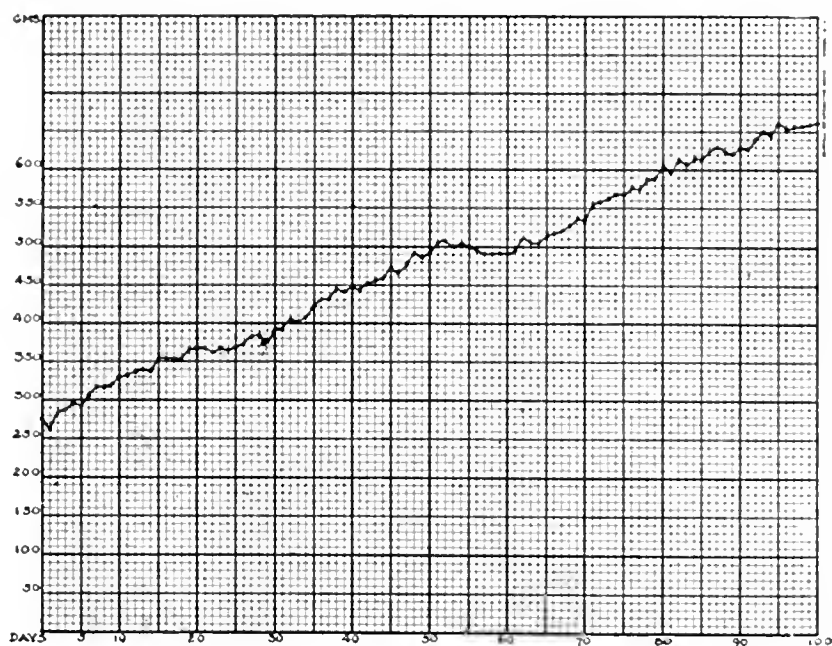


CHART 24.—Guinea-pig receiving 5 grams of pancreas daily.

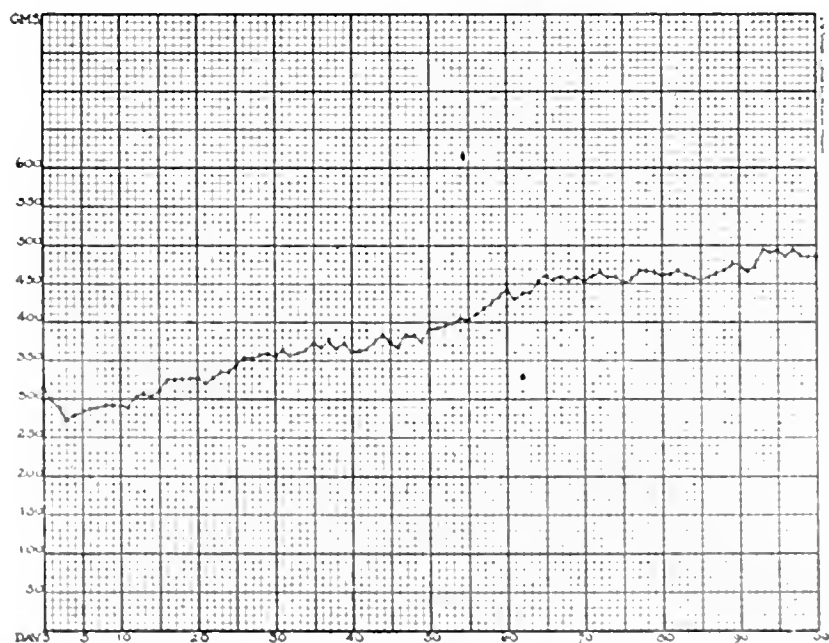


CHART 25.—Guinea pig receiving 5 grams calves' brains daily.

able value in the prevention of scurvy among Arctic explorers and in armies under certain circumstances. It still remains possible that the relatively large amount of meat that can be consumed by a man may have some antiscorbutic power. But it is certain that the antiscorbutic potency of organs such as liver, spleen, lungs, and kidney is infinitely greater, in fact more potent than fruit juices or most green vegetables.

Passing to the discussion of the physiological action of the antiscorbutic vitaliment, it is astonishing that this substance cannot be demonstrated in the circulating blood. It would seem that it must enter the blood in order to be carried to the various organs where it is shown to be present, and it may be assumed that it is appropriated by these tissues as rapidly as it appears in the blood so that at no time is there any reserve in the blood. This is only one of the arguments that show that a constant supply of this vitaliment is a necessity of cellular metabolism. It takes only about fifteen days for a young guinea-pig to develop demonstrable scurvy. When the disease is demonstrable clinically it is already far advanced. The disease does not appear full blown suddenly at the end of the fifteenth day, and we can only conclude that retrograde changes commence at once as soon as the supply of this essential vitaliment is cut off. In the case of fowls deprived of the antineuritic vitaliment, Vedder and Clark (5) found pathologic changes in the peripheral nerves as early as seven days after the diet of highly milled rice was instituted. Thus we find that a constant or almost daily supply of vitaliment must be furnished to prevent certain retrograde changes—that is, there is practically no vitaliment stored in the body. If it is not stored and is present in the glandular tissues, it must be present as an integral part of those tissues.

With these facts in hand, two hypotheses as to the action of the antiscorbutic vitaliment may be suggested:

1. That this substance functions in the metabolism of food somewhat as the pancreatic secretion acts in the combustion of glucose, or as McCarrison (6) has said, that "it is like the spark which ignites the fuel mixture of a gas engine, thus liberating its energy. The spark is of no use without the fuel, nor the fuel without the spark."

2. That these substances are essential building stones for certain cells, without which all activity of these cells must cease. McCarrison has based his explanation of the action of the vitaliments partly upon the observations of Funk (7) and Braddon and Cooper (8) and partly upon his own observation that the larger the amount of butter and starch in the diet of pigeons and monkeys the quicker was the onset of beriberi.

Funk and Braddon and Cooper both believed that the greater the

amount of carbo-hydrate fed the more rapid was the onset of beriberi and the greater was the amount of antineuritic vitaliment necessary to prevent polyn neuritis gallinarum. But it has been shown (9) that the rapidity with which polyn neuritis gallinarum appears bears no relation to the amount of starch eaten but depends upon other factors. Fowls fed on sterilized meat or egg will develop polyn neuritis even though there has been no starch in the dietary, and, moreover, the addition of starch to this diet, instead of hastening the onset of the disease, actually delays it.

McCarrison found (10) that "a degree of avitaminosis which will produce a definite train of symptoms in the presence of an excess of starch, will produce the same, or approximately the same, train of symptoms almost twice as rapidly if there be also an excess of fats in the dietary." "In short, the greater the intake of starches and fats, the greater must be the intake of vitamine B." It does not appear that this last conclusion is justified by the observed facts which are capable of quite a different explanation. I also attempted to feed guinea-pigs butter, but found that amounts as small as 1 or 2 e.c. of melted butter daily caused a rapid loss of weight and death of the guinea-pig in four or five days, long before the development of scurvy. At necropsy these guinea-pigs showed inflammation of the stomach and intestines. It is quite certain that butter is an unnatural food for guinea-pigs and caused death from indigestion. It seems quite possible that this is the explanation of McCarrison's experiments in which butter was added to the diet of pigeons and monkeys. At any rate there is nothing in any of these experiments that definitely proves that either of the vitamins is concerned in the metabolism of the food supplied. It is a possibility, but remains an unproven hypothesis.

In support of the hypothesis that the vitaliments form actual building stones of certain tissues of the body and that cellular metabolism ceases when these essential elements are withdrawn, we have the observed facts that in both beriberi and scurvy the respective vitaliments are actually component parts of many of the tissues of the body, that they are not stored but must be supplied daily. That they act hypodermically or intravenously quite as well as when administered by mouth, and that when they are deficient the tissues cease to function and finally degenerate. That young growing animals are more susceptible to these deficiencies than adults whose metabolic processes are not so active, that physical exertion and cold, factors that cause an increased metabolism, hasten the onset of both beriberi and scurvy. It is hoped that future investigations will throw more light on the rôle played by the vitamins in the tissues.

I wish to acknowledge the assistance of Capt. Brooks C. Grant, M. C., and Capt. Rufus S. Holt, M. C., who have aided me in carrying out the details of these experiments.

## REFERENCES

1. Ashby: The Determination of the Length of Life of Transfused Blood Corpuscles in Man. *Jour. Exper. Med.*, 1919, xxix, 267.
2. Dutcher, Pierson and Biester: The Antiscorbutic Properties of Raw Lean Beef. *Science*, n. ser. 50, 1919, No. 1286, 184.
3. Givens and McClugage: *Science*, March 20, 1920, 273.
4. Stefansson: Observations on Three Cases of Scurvy. *Jour. Amer. Med. Assn.*, 1918, lxxi, 1715.
5. Vedder and Clark: A Study of Polyneuritis Gallinarum. *Philippine Journal Science*, 1912, vii, 423.
6. McCarrison: *Studies in Deficiency Disease*. Oxford Press, 1921, 210.
7. Funk: Die Rolle der Vitamine beim Kohlenhydrat-Stoffwechsel. *Zeitschr. f. Physiol. Chem.*, 1914, lxxxix, 378.
8. Braddon and Cooper: The Influence of the Metabolic Factors in Beriberi. *Jour. Hygiene*, 1914, xiv, 331.
9. Vedder: Is the Neuritis-Preventing Vitamine Concerned in Carbohydrate Metabolism? *Jour. Hygiene*, March 28, 1918, xvii, No. 1.
10. McCarrison: *Studies in Deficiency Disease*. Oxford Press, 1921, 28.



# IDIOPATHIC TROPICAL PYREXIA WITH SPECIAL REFERENCE TO INTERMITTENT NON-MALARIAL FEVER

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(With one chart)

IN CALLING attention to an idiopathic tropical pyrexia it may be of some interest to medical officers stationed in the tropics and sub-tropics to briefly mention a few of the many fevers that come under the above heading. The student of tropical medicine is constantly seeing cases that, from an etiological point of view, defy diagnosis. Symptomatically various names are applied. This is often necessary in order to satisfy the patient, and then again as an artificial diagnostic sop to Cerberus. Idiopathic is hardly the correct term to apply to an unclassified tropical pyrexia, but in so far as there are a great variety of these tropical fevers, as the short history will show, the term does answer a purpose and is in a way useful in grouping a variety of tropical and sub-tropical diseases that need further study and investigation before an exact diagnosis can be arrived at.

## SOME OF THE MORE IMPORTANT UNCLASSIFIED TROPICAL PYREXIAS

Very similar to and no doubt but a variety of dengue are a number of fevers that closely resemble it. Such for example is Rogers' Seven Days' Fever, originally described in 1905. There is Pseudo-Dengue Fever of Cochin China. Deeks has described a Six Days' Fever of the Canal Zone, and Smith and Laughlin a Six to Eight Days' Fever of Aden. There is the Fever of the Antilles, the Fever of the Red Sea and a host of other geographically described fevers, all symptomatically very similar to dengue, differentiated from it only by locality.

More complex are some of the following, and probably are in themselves distinct disease entities, yet more work is necessary in order to classify these diseases and separate the true from the false. It is so easy for one working in the tropics to conscientiously describe what seems to be a new disease, and thus add to instead of clearing away the confusion that now exists, that it is surprising not to find a greater variety of these unclassified tropical pyrexias reported.

Manson first described a double continued fever that closely resembles typhoid fever except that after ten to fifteen days the fever falls by lysis, remains normal for two or three days, and then a second paroxysm of fever sets in and continues for about two weeks. This is followed by an uncomplicated convalescence of a rather protracted nature.

Thompson and Benett and, later, Castellani described a hyperpyrexial fever, the cause of which is not known. The attack is similar to malaria, but on the third day the fever rises to 104-107° F., at which it remains unless cool bathing is resorted to, as drugs have no effect whatever. This high temperature may continue for six or seven days, or it may remain 105° F., for two or three weeks and then gradually fall to normal.

Cobb's pigmentary fever is sudden in onset, the temperature reaching 103-104° F., in a few minutes. With this high temperature is associated a general feeling of illness, and later this is followed by a peculiar pigmentation of the nose and face. The fever usually lasts about a week, but the pigmentation may last several months.

Naegle has described a peculiar urticarial fever which Bassett-Smith ascribes to food poisoning. It consists of a mild fever associated with a profuse urticarial eruption on skin and mucosae. Rheumatoid pains, loss of muscular power and marked nervousness are the prominent features.

Forrest described a fever lasting about two weeks and resembling a parabola curve. It is supposed to be a local disease of Rangoon, but is probably only a geographical variety of some common mosquito-borne infection.

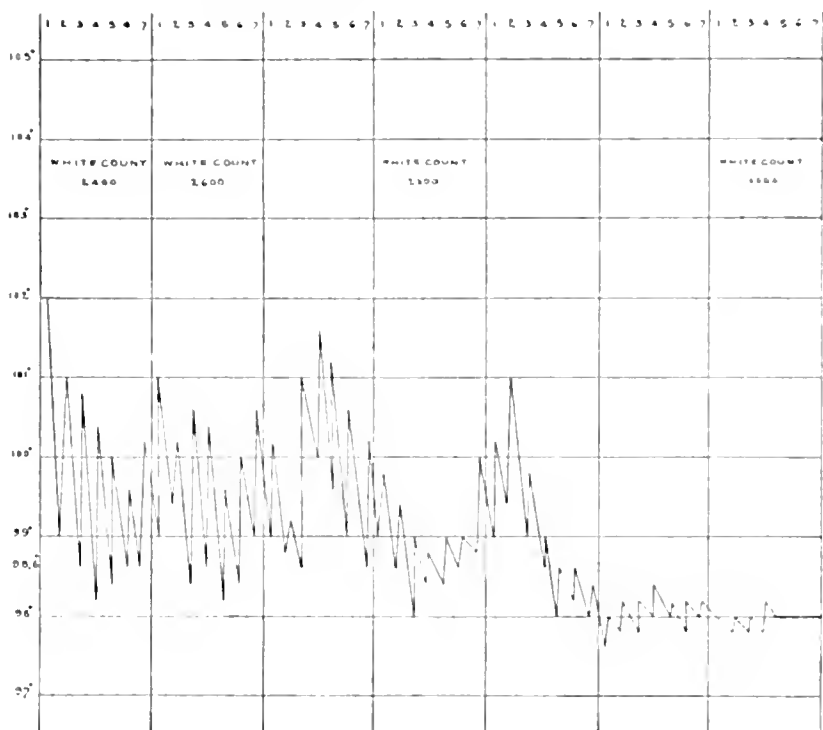
Some of the other obscure fevers one reads about are Kyoto fever, described by Masuda in 1918, Tacamochio fever, described by Henao in 1918, Nasha fever, described by Fernandez in 1894, as occurring in Bengal. Connor, Bruel and Hayatt in 1910 described a macular fever of Tunisia. Montel and, later, Sarailhe in 1916, described a disease of Cochin China which they called Ban Baeh. Castellani describes a number of peculiar diseases of obscure origin and interesting symptomatology under the names of anemic fever, papular fever, vesicular fever, and others.

#### INTERMITTENT NON-MALARIAL FEVER

I wish to call attention to an intermittent non-malarial fever that is similar to a disease described by Castellani as high or low intermittent non-malarial fever, depending upon the severity of the temperature. This disease is so constant in its symptomatology and so characteristic as to blood findings that there can be no doubt as to its being a distinct disease entity. This disease is not uncommon in Siam, and Murray mentions having observed a disease similar to it, but it is seldom mentioned as occurring in other places with any frequency, or in fact at all except in India.

In describing the disease I cannot do better than give a short history

URINE    NORMAL  
 BLOOD CULTURE    NEGATIVE  
 STOOLS    NEGATIVE



of a case recently in hospital for treatment. This particular case is similar to a number of others seen during the last three years.

The patient was a European, male, aged 33. Took sick quite suddenly during the night. He had a distinct chill, perspired freely, and shortly after work registered a temperature of 101° F. The temperature chart is characteristic of the cases observed. During the several weeks' observation the only other complaint was a vague rheumatoid pain in the right lumbar region, and it may be mentioned that other patients complain of the same pain, in some it being distinctly hepatic, but without any enlargement of the liver. The patient felt remarkably well all of the time and would have insisted on going to work except for the fact that his temperature was abnormal. I have in mind at present a patient suffering from the above, but who insists on keeping on with his work although his temperature is never below 101° F. and the hepatic pain is always present.

The blood picture in these cases is interesting and quite distinct from that of any other infection.

The reds in this case, as in others, were normal, as was the hemoglobin content. The white count shows a marked leucopenia which is, in fact, an absolute lymphopenia. (See notation on temperature chart, 2,300-4,000 whites.)

	<i>Per cent</i>
Polymorphonuclears . . . . .	79
Large mononuclears . . . . .	9
Large lymphocytes . . . . .	6
Small lymphocytes . . . . .	2
Eosinophiles . . . . .	4

The urine in these cases, as in this particular case, shows nothing. The stools are quite negative. Blood examinations proved negative for microfilaria, spirochetes or haemameba of any kind. Blood cultures were negative, as were any specific reactions, as for typhoid, para A or para B.

There was no protracted convalescence. Except for a moderate physical weakness incident to inactivity there were no after effects, and a slight loss in weight, as the result of a self-imposed, restricted diet, was made up in a very short time.

*Diagnosis.*—This is a matter of differential diagnosis. Typhoid fever and paratyphoid A and B must be carefully considered, because, as observed in the tropics, it is often quite different as seen in temperate climates. Malaria must be ruled out as well as the relapsing fevers. Fever due to filarial infection is not uncommon, and often difficult to diagnose. The direct diagnosis depends upon the following positive and negative cardinal signs and symptoms.

1. Remittent temperature, rarely above 102° F.
2. Absolute small lymphopenia, more marked than in any other disease.
3. Relative eosinophilia in the absence of intestinal parasites.
4. Negative physical findings except for vague lumbar or hepatic pain.
5. Negative blood findings as regards specific reactions and organisms.
6. Negative therapeutic results.
7. Short convalescence out of all proportion to length of illness.

*Prognosis and Treatment.*—The prognosis is good. I have seen no fatalities. The treatment is entirely symptomatic. It is advisable to put these cases on a full diet as there is no danger of intestinal complications.

*Prevention.*—There is no doubt in my mind but that this is a mosquito-borne infection and the usual anti-mosquito measures are indicated.



# DIPHTHERIA AS SEEN IN THE AMERICAN FORCES IN GERMANY

## DIFFERENTIAL DIAGNOSIS; TREATMENT; THE SCHICK TEST

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AT PRACTICALLY no time during my service at this hospital has the command been free of diphtheria; however, at no time has the number of cases been alarming. The present report covers the handling of patients with throat conditions (inflammations) from October, 1920, to October, 1921. The seasonal and organizational distribution have been of no special note.

*Diagnosis.*—All patients admitted to this hospital suffering from inflammation of the throat are admitted to the contagious service. There is an observation ward in this service and this class of patient is held there until the diagnosis is made and diphtheria at least diagnosed or ruled out; the proper transfer is then made. Negative cases are held until there are two negative cultures on consecutive days for the Klebs-Loeffler bacillus. A culture is taken on blood serum in the receiving ward and a second one taken immediately upon arrival of the patient at the ward. The specimen is taken from the area showing the most marked pathology. The swab is examined for the treponema Vincenti (Vincent's angina) and the culture incubated twelve hours before being examined for the Klebs-Loeffler bacillus. A specimen of blood is taken for the Wassermann test and a sample of urine routinely examined. The Schick test (described below) is done on all admissions to the contagious service—at 9 a.m. for the night admissions and at 4 p.m. for the day admissions. Besides the above-mentioned cultures, a culture is taken for Klebs-Loeffler and Vincent's angina every day on every throat patient until the diagnosis is made and then on every diphtheria patient and carrier until the case is disposed of. The double culture on admission is important. It not infrequently happens that one is positive and the other negative. Our patients are received early and sometimes with but little changes in the throat.

Physical examinations are made promptly upon arrival of the patient at the ward and the clinical history written. At the end of forty-eight hours one has the following information at his disposal upon which to base the diagnosis: the clinical history and physical examination, the results of three throat cultures, two daily readings of the Schick test and possibly the results of the Wassermann (these Wassermann tests are made twice weekly).

Inflammation of the throat is a sign and symptom associated with many diseases, but it is dealt with in this report as a leading complaint. There are four diseases encountered here with an organized exudation in the throat, namely, diphtheria, follicular tonsillitis, Vincent's angina, and syphilitic ulceration. The Klebs-Loeffler bacillus is also found in the throats of patients suffering from catarrhal inflammation of the tonsils or pharynx, etc., at times. In other words, we have a patient with a positive Klebs-Loeffler throat culture. Has he diphtheria or is he a diphtheria carrier and is there any other disease associated? We have had patients suffering from all of the above-mentioned diseases with positive Klebs-Loeffler cultures.

The differential diagnosis is at times difficult; however, the diagnosis must be made and the antitoxin given to the diphtheria patient at the earliest possible time. This is necessary if complications are to be avoided. Serums are so extensively used at present that one should avoid sensitizing patients whenever this is possible. The serum should be given only to those patients suffering from diphtheria; it is of no value in the treatment of carriers.

I have great faith in the Schick test as indicating immunity to diphtheria. This test will be briefly described. When the test is properly done—that is, when the dose of toxin and control are correct, the injections properly made and the findings properly read—it offers a most valuable indication of the susceptibility of the individual to diphtheria. I had the good fortune to visit Vienna, and to meet Prof. B. Schick. This celebrated professor explained in detail his test and gave me the liberties of his clinic under the direction of an assistant, Dozent Cassowitz. Unknown diphtheria toxins were tested on guinea-pigs to determine the dosage. Tests were made and read. The instruction was of great value and a number of confusing points were made clear to me. The method used in the Station Hospital, Coblenz, is that used elsewhere. The method of recording the findings was developed at this hospital.

Two 1-centimeter syringes (antitoxin) are used. These are graduated in tenths, one for the test and one for the control. Two needles are used for each patient, one for the test and one for the control, thus avoiding mixing the solutions. However, many tests were made using the same needle on both arms. It is important to have the needles small and sharp. The diphtheria toxin is used in the following dose:  $\frac{1}{50}$  minimum lethal dose in  $\frac{1}{10}$  c.c. salt solution for a guinea-pig weighing 250 grams. When there is doubt as to the strength of the toxin, intradermal injections are made into the shaven skin of the abdomen of a guinea-pig, commencing with solutions known to be too weak and

continuing concentration until a too strong solution is used. A control is to be used at the same time. All injections can be made at the same time on the same pig. The dilution is to be selected that gives the proper reaction. The readings are made in the same manner as the Schick test on the human.

Two controls have been used; one is the same toxin solution as used for the test but heated for five minutes at 75° C. The other is the same toxin solution but overneutralized by the addition of antitoxin and incubated for two hours to insure combination. I prefer the former, as it is the easier and quicker to prepare. Thus, twice as much toxin solution is prepared as required, take one half and make the control.

The area just below the elbow joint on the anterior surface of the forearm is used for the site of the injection. Always make the control injection first and on the right forearm. If this plan is followed, it will simplify the method of reading and recording and will often prevent confusion. It is essential that the injections be made intradermally and as superficially as possible. Hold the syringe with bevel of the needle up, insert the tip into the epidermis, lower the syringe until it about touches the forearm, and while rotating the syringe through about 90 degrees push the needle into the skin until the opening in the end of the needle is entirely within the skin. This tip can usually be seen as a dark spot through the epidermis. Inject the solution and, if the needle has been properly inserted, a small wheal resembling a mosquito bite will develop at the site of the injection. If the injection has not been made properly, withdraw the needle and make another injection. No harm is done by several injections.

The readings are made 24, 48 and 72 hours after the injections. There are four points to be carefully studied and recorded—redness, induration, swelling and pigmentation. I use large letters to represent this: "R" "I" "S" "P" and the following symbols to represent degrees: "1, 1 2, 2 3," In addition "p" is used after redness to indicate the slight reaction following the trauma done by the needle. Where all are negative, a line is drawn under all of the letters with a zero at the end, thus, R I S P<sub>0</sub>. This is merely to save time. The following is an example of the average negative reaction:

R I S P<sub>0</sub> (right) R I S P<sub>0</sub>—24 hours, the redness disappearing on the 48 and 72-hour readings. The following is an example of a typical positive case:

(Right)—C		(Left)—T—
<u>R</u> <u>I</u> <u>S</u> <u>P</u> <sub>0</sub>	24 hours	<u>R</u> <sub>2</sub> <u>I</u> <sub>+</sub> <u>S</u> <sub>1</sub> <u>P</u> <sub>0</sub>
<u>R</u> <u>I</u> <u>S</u> <u>P</u> <sub>0</sub>	48 hours	<u>R</u> <sub>1</sub> <u>I</u> <sub>2</sub> <u>S</u> <sub>1</sub> <u>P</u> <sub>0</sub>
<u>R</u> <u>I</u> <u>S</u> <u>P</u> <sub>0</sub>	72 hours	<u>R</u> <sub>1</sub> <u>I</u> <sub>1</sub> <u>S</u> <sub>1</sub> <u>P</u> <sub>+</sub>

Redness appears in all positive cases and lasts several days. It also occurs in cases that are not positive. I consider induration the most reliable of the four findings. Pigmentation is a late manifestation in my experience, usually appearing after the second day. It is more common in the test arm but also occurs on the control arm. Scaling is also a manifestation but usually occurs even later than pigmentation and seems to be based upon inflammation of the skin. Where there is little or no inflammation there has been no scaling; where there is marked inflammation scaling usually occurs. Pigmentation usually disappears in a few weeks or less but has lasted five months in this series. It is not always present.

There is a small percentage of cases that gives reactions in the control arm very nearly if not exactly similar to the test arm. These are called pseudo-reactions and may be divided into combined negative and combined positive. The following are examples as interpreted here:

Combined Positive			Combined Negative	
(right)—C	(left)—T		(right)—C—	(left)—T
$R_1+I_1 \underline{S} \underline{P}_0$	$R_+ I_1 \underline{S} \underline{P}_0$	24 hours	$R_1+I_1 \underline{S} \underline{P}_0$	$R_1 I_1 \underline{S} \underline{P}_0$
$R_1+I_1 S_+ P_0$	$R_1 I_2 S_1 P_0$	48 hours	$R_1 I_1 \underline{S} \underline{P}_0$	$R_1+I_1 S_+ P_0$
$R_+ I_1 S_+ P_0$	$R_1 I_1 S_+ P_0$	72 hours	$R_1 I_+ S_+ P_0$	$R_1 I_+ S_+ P_0$
$R_+ I_1 S_+ P_0$	$R_1 I_2 S_1 P_+$	160 hours	$R \underline{I} \underline{S}_0 \underline{P}_2$	$R \underline{I} \underline{S}_0 \underline{P}_2$

By carefully recording the findings from day to day I have usually had no difficulty in arriving at a conclusion at the end of seventy-two hours or sooner, but there are cases that require observation and study for several days longer before a conclusion can be drawn. This conclusion should be arrived at and recorded at the last reading. In my experience it is difficult to interpret combined reactions correctly, and one runs an appreciable risk in interpreting them wrongly. Under such conditions one may call a positive case negative. I have made this mistake, which was proven by the patient contracting diphtheria. I believe it safer to call all such cases positive and to immunize them as in any other positive cases. The above system of recording the findings from day to day gives a picture of the reactions that can be studied and made of permanent record.

The Schick test was started as a routine in the contagious service of this hospital in the spring of 1921. Since that time 846 such tests have been made. When testing large numbers, the tests have been made at the rate of four per minute and readings at six per minute. One can often interpret a typical negative or positive result by the second reading and, knowing that a negative Schick, represents immunity to diphtheria, this is of great assistance in arriving at a conclusion as to

whether the patient in question is suffering from diphtheria or is only a carrier with some associated disease. There have been numerous instances here where the diagnosis of carrier was made partly on the Schick test. It is also of value in diagnosing diphtheria. Some of these cases had been previously tested. It would be of great value to know the state of immunity to diphtheria of every person in a command. This is possible.

The patients in this service are almost entirely soldiers averaging 21 years of age and weighing about 140 pounds. Reference to the table below will show that the patients ran a higher percentage of negative tests than the other persons tested, including 285 enlisted men on duty in the hospital.

	No.	Positive per cent	Negative per cent	Pseudo per cent
Officers (duty).....	18	45.55	50.00	4.45
Nurses (duty).....	43	37.21	51.16	11.62
Enlisted men (duty).....	285	29.82	61.75	8.43
Enlisted men (patients).....	500	22.50	72.50	5.00
Average.....		33.64	58.85	6.71

The more one uses the Schick test the smaller becomes the number of reactions recorded as pseudo. It is believed that there is no constitutional reaction following this test. There were two patients who complained of headache, chilly sensations and slight fever in the first twenty-four hours. There were two cases severe enough to record as R<sub>3</sub>. The redness in the latter cases was very marked and covered an area 2½ inches in diameter with proportionate swelling. This was followed by pigmentation and scaling. All inflammation subsided in a week without suppuration. There was one case of local suppurative cellulitis in the control arm. No other suppuration has been encountered.

The throat patients, as seen here, can be divided into five classes:

1. There is a catarrhal inflammation of the throat, some elevation of temperature, no membrane, no ulceration, breath not foul, Schick test negative so far. This is probably a case of catarrhal tonsillitis plus carrier state. It will be confirmed by the absence of toxemia, negative Schick and rapid improvement without specific treatment.

2. The tonsils enlarged and acutely inflamed, the crypts distinct and filled with whitish necrotic matter, no distinct membrane, no edema of the uvula, larynx clear, some toxemia, temperature possibly 102, breath not particularly foul, Schick test negative so far—probably follicular tonsillitis plus carrier state.

3. Ulceration, sometimes in the tonsilar region, sometimes on the pharyngeal wall, slow onset, little or no elevation of temperature, little or no toxemia, very little pain, edema of the uvula usually not present, other signs of syphilis. Syphilitic ulceration plus carrier state. This

is proven by negative Schick, positive Wassermann and other signs and symptoms of syphilis.

4. Ulceration, usually tonsillar, with or without ulcerative gingivitis. This ulceration may be found in any part of the mouth or throat; it is moderately slow in onset, either superficial or deep, not particularly painful; temperature may be normal but usually ranges from 99 to 101°F. Inflammation is not marked around ulcerative areas. There is little or no toxemia; the breath is quite foul. According to Lieutenant Gill, M. C., a moderate leucocytosis and eosinophilia are usually present. Such a condition is probably treponema Vincenti infection plus carrier state. This may be proven by negative Schick with positive throat examination (dark field) for the treponema. This disease has been quite common among the American forces in Germany.

5. More or less sudden onset with painful sore throat and fever; the breath is foul and the tonsil is covered with a dirty grayish exudate (membrane) which is more or less adherent and leaves a bleeding surface when removed, there is toxemia, rapid pulse, edema of the uvula, probably hoarseness, so far the Schick test is positive. This case should be called diphtheria and immediately treated with antitoxin.

Cervical adenopathy has not been mentioned. It represents an infection about the mouth, throat, sinuses, etc., but throws no light on the type of infection. If one could associate a membrane only with diphtheria and differentiate it from all other exudations found in the throat, the diagnosis would be easy, but this cannot always be done. We have had cases of all of the above-mentioned diseases, namely, follicular tonsillitis, syphilitic throat ulceration and Vincent's angina, that could not be differentiated from diphtheria by the local appearances alone. When such a case gives a positive throat culture for the Klebs-Loeffler bacillus, the differential diagnosis becomes even more important.

Since October, 1920, there have been 134 patients admitted to this service with throat cultures positive for the diphtheria bacillus. They were divided as follows: diphtheria, 65 (48.51 per cent); carriers, 69 (51.49 per cent). All these cases have been in adults except one (a child of ten years), and all have been pharyngeal diphtheria. In one case the membrane extended into the nasal passages. These positive Klebs-Loeffler cases have been associated with other diseases as follows:

<i>Diphtheria</i>		<i>Carriers</i>
With follicular tonsillitis . . . . .	11 (16.9%)	36 (52.1%)
With Vincent's infection . . . . .	16 (24.6%)	11 (15.9%)
With peritonsillar abscess . . . . .	3 (4.6%)	0
With syphilitic ulceration . . . . .	0	7 (10.1%)
With catarrhal tonsillitis . . . . .	0	12 (17.4%)
Total number . . . . .	50	69

It is of interest to note that there have been no peritonsillar abscesses in carriers and no syphilitic ulcerations with the diphtheria cases.

*Treatment.*—On admission, all patients are given a bath and put to bed. They get two grains of calomel and 30 c.c. saturated solution of salts twelve hours later. Liquid diet is given until the bowels act freely and then light or full diet according to the temperature and appetite. A specimen of blood is taken for the Wassermann, the Schick test is given, and a throat culture is made for the Klebs-Loeffler bacillus and treponema Vincenti. They gargle, every four hours when awake, with 50 per cent Dobell's solution, and the following "throat paint" is well applied, paying especial attention to the tonsils:

Salicylic acid.....	125 00
Oil of cloves.....	30 00
Formalin.....	25 00
Alcohol.....	250 00
Spirit nitrous ether.....	125 00
Glycerine q. s.....	1,000 00

Care must be taken to have no excess of this solution on the swab as it is irritating if allowed to flow into the lower pharynx. If negative cultures are not obtained in a few days after the treatment commences, the number of applications is increased to twice daily. In persistent cases we have used it three times a day. The superficial albumin is coagulated by this mixture, leaving a grayish-white appearance of the mucous membrane.

The throat cultures are received from the laboratory in from twelve to twenty-four hours, showing whether or not the diphtheria bacillus and treponema Vincenti are present. If positive for diphtheria, all available evidence is studied to determine whether or not the case is clinical diphtheria or carrier state. The patient is then transferred to a ward set aside for diphtheria cases or carriers as the case may be. As soon as a negative culture is received, the case is transferred to the convalescing diphtheria or carrier ward where it remains until discharged. Our standard for release from discharge is three negative consecutive Klebs-Loeffler cultures for carriers and five for diphtheria at daily intervals.

All patients receive the same local treatment. Many different forms of local treatment have been used, but the above-mentioned prescription has proven most satisfactory of all. The average time lost in hospital has been 15.5 days for diphtheria and 8.77 days for carriers. The longest that any carrier has remained in hospital has been 21 days, and the longest for any diphtheria patient has been 33 days. The longest that any carrier has remained positive who did not have Vincent's angina as an associated disease has been 15 days. Where the treponema Vincenti was present both diphtheria and carriers have been

slower becoming negative than where this organism was not present. All cases have cleared up with no other local treatment than above described. No operative measures have been used. Some cases had large tonsils, also sinusitis, but cleared up without operation.

There has been no constitutional treatment for carriers. Antitoxin has been administered just as soon as the diagnosis of diphtheria is made and in a few instances without waiting for the result of the culture. The antitoxin treatment in this hospital has been along two different lines, namely, smaller and often repeated doses or one single large dose. The first method was used until April, 1921, and the latter has been used since. With the first method 10,000 units of antitoxin was given subcutaneously. This was followed on the following day by 5,000 or 10,000 in 23 cases. Seven cases received three doses on consecutive days and two received four doses on consecutive days.

The second method of treatment is as follows: The patient is carefully questioned to determine whether or not he has received any serum of any kind in the last five years. If he says "yes," 0.5 c.c. antitoxin is given subcutaneously and the patient watched for six hours; 20,000 units of antitoxin are then given subcutaneously. Otherwise the antitoxin is given intramuscularly into the buttocks, care being taken not to inject too near the sciatic nerve, hip joint or sacroiliac synchondrosis. We have also used, with good results, antitoxin out of date (as stamped on the container) by increasing the dosage 1 per cent per month. American antitoxin only has been used, 10,000 units per ampule, giving the entire amount in one injection with a 20 c.c. Luer syringe. Under the first method of antitoxin treatment, there have been ten cases with complications, two with serum reactions and eight with post-diphtheritic polyneuritis. Of the last, two were returned to the United States for further observation and treatment, the remaining six returned to duty. Under the second form of treatment there has been one case of serum sickness and no neuritis. It is true that the same length of time has not elapsed. It was never necessary to repeat the dose, but this dose would have been combined with intravenous antitoxin had any case been advanced or had laryngeal diphtheria. A hypodermic of adrenalin is always at hand when giving antitoxin but has rarely been used. The heart has been carefully watched (including the use of the polygraph before going to duty), but no complications have been detected before discharge (1). Diaphragmatic involvement, too, has been looked for on account of its seriousness, but no case developed. The serum reactions have appeared in from 5 to 8 days and lasting not longer than five days; they were treated by saline purge, light diet and adrenalin hypodermatically when needed.



The majority of carriers and diphtheria cases were found positive on the first culture. Occasionally the ward culture was positive and that of the receiving ward negative or the reverse. Three cases of diphtheria had two negative cultures before a positive one was obtained, and a similar condition applied to five carriers. One case of diphtheria was not positive until the fifth culture. This case had a positive Schick test and was clinically positive for diphtheria. The average number of cultures examined to obtain a positive one has been for diphtheria 1.30, and for carriers 1.34. This shows the importance of not relying upon one culture for a diagnosis. The temperature was not over 99.4° F. in any case after the second day following the administration of antitoxin unless there was a complication. The temperature was usually normal by that time. The temperature is a valuable index to the progress of the patient. In this series there have been cases of influenza, bronchitis, broncho-pneumonia, gonorrhea and syphilis as associated diseases. There have been no deaths.

A French toxin (Paris) and Park's toxin (New York) have been used for the Schick test. The latter is preferred and is conveniently prepared for use. The administration is simple, and the head nurse on the Contagious Service has made many of the injections. The tests are read by me. In addition the nurses are taught the method of administration and the dangers in giving the antitoxin. They usually give the antitoxin in cases where there is no serum history.

Patients with two or three negative Klebs-Loeffler cultures (sore-throat but Klebs-Loeffler negative) are transferred to the Ear, Nose and Throat Service for completion of their treatment. Since the system of handling patients suffering with sore throat was put into effect it has not been necessary to quarantine any ward on account of diphtheria. These cases are now always diagnosed in the contagious service. It is impossible for the receiving officer always correctly to diagnose these patients, and when we were attempting it diphtheria appeared in many wards of the hospital, requiring quarantine and culturing.

Originally the observation ward had cubicle sheets between all beds. All patients were required to wear gauze masks made of six thicknesses of gauze. The attendants were very careful to wear masks and to change their gowns on entering and leaving this ward. Finally the usage of masks for the patients stopped, and then for the personnel except when making examinations and giving treatments. The personnel became careless about changing their gowns on entering and leaving the ward, and finally the cubicle sheet disappeared. Under neither method has there been a case of cross infection. However, great stress is put on the following procedure: boiling of all dishes im-

mediately after use; fly elimination; thorough washing of the hands, keeping the fingers out of the mouth and nose; separate thermometers completely submerged in phenol solution when not in use; separate and covered sputum cups; and the proper care of the sputa. During the period covered by this report there have been 877 patients admitted to the observation ward. They remain about two days unless a positive diagnosis is made sooner and are then transferred. This ward is merely a clearance ward.

There has been no immunization of the command by artificial means. Antitoxin has not been given for passive immunization except in one case, that being the mother of the child above referred to. She desired to remain continually in the room with the child. There has been no toxin-antitoxin immunization. Altogether, there have been 1,593 days lost in hospital by patients with positive Klebs-Loeffler cultures—diphtheria 987 and carriers 605. It is believed advisable to test the state of immunization of all persons connected with the Army—officers, soldiers, civilians—by means of the Schick test and to immunize those found susceptible. It would appear that by this means diphtheria can be eliminated from the Army as the typhoids have been. This method has been used on a large scale with the school children in New York City (2).

The streptococcus has been looked for routinely in about 700 of the above admissions but furnished no information of value, and the search for it has been discontinued as a routine. There have been no cases in this series that one could diagnose as chronic diphtheria (as described by Friedman (3)).

#### SUMMARY

1. All army hospitals receiving patients from a large command should have an observation ward for patients suffering from throat inflammations.

2. Cultures should be taken for the Klebs-Loeffler bacillus and the treponema Vincenti in the receiving ward, and immediately upon arrival of the patient in his ward a second one should be taken. Both cultures and swabs should be sent to the laboratory. Cultures should be taken daily thereafter until the case is disposed of.

3. The Schick test is a valuable aid in the diagnosis. It is easily applied and read. The findings should be recorded in such a manner that they represent a picture of the reactions and can be studied at any subsequent time. One must know the toxin he is using.

4. There are cases of follicular tonsillitis, ulceration of the throat and necrosis due to the treponema Vincenti that one cannot differentiate from diphtheria by the throat appearances alone.

5. Antitoxin should be given early and in large doses, remembering that antitoxin will not repair any destroyed tissue. Twenty thousand units intramuscularly is the usual dose used in this service for adults. One can use the weight as a guide, giving from 100 to 500 units per kilogram, depending upon the severity of the case.

6. The formalin-salicylic acid-alcohol "throat paint" has proven to be satisfactory as a local treatment for diphtheria cases and carriers and for treponema Vincenti ulcerations. No operative measures have been necessary for the treatment of carriers.

7. There have been no deaths and no serious complications under the present form of treatment. There have been cases of post-diphtheritic polyneuritis following the former method of smaller repeated doses.

8. One should not rely upon one negative Klebs-Loeffler or Vincent's angina culture for diagnosis. Three cultures on two consecutive days has been satisfactory here. Our standard for release from quarantine has been three negative Klebs-Loeffler cultures for carriers and five for diphtheria cases on consecutive days.

9. It is believed that the time has come for the immunization of persons of the Army who are susceptible to diphtheria.

10. There is nothing in this paper intended to justify awaiting the results of the Schick test or even of the throat culture before giving the antitoxin to a patient whose affection clinically is diphtheria. The majority of our cases have not fallen in this class, and the statement that "A throat requiring a culture for diagnosis requires antitoxin for treatment" does not apply in this service.

#### REFERENCES

- (1) "Observations on the Heart in Diphtheria": S. Colvin Smith. *Journal American Medical Association*, September 3, 1921, page 765.
- (2) "Diphtheria Prevention Work in the Public Schools of New York City:" Abraham Zinghar. *Journal American Medical Association*, September 10, 1921, page 835.
- (3) Friedman: *Über Chronische Diphtheritis und Lues* (Aus der Infektionsabteilung des Rudolf Virchow Krankenhaus in Berlin). *Berliner Klinische Wochenschrift*, S. 376, April 18, 1921.



## EXPERIENCES WITH HOOKWORM

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THIS paper lays claim to little that is original, but in view of the great prevalence of hookworm infection in the extreme south and its sporadic—although infrequent—occurrence here, where isolated cases, probably importations, have been seen in most of the northern states, I venture to relate these experiences and to present these facts in the hope that they will prove of some interest.

Let us begin with a brief consideration of the hookworm and its life cycle, so that we can the more readily understand the occurrence, the significance and the dissemination of this parasitic infection. Since the appearance of the masterly monograph of Stiles in 1901, it is no longer open to question but that there are two kindred varieties of this parasite, both belonging to the nematode family Strongyloidae of worms, which resemble one another very closely in their general characteristics but which differ sufficiently in certain particulars to merit a distinct class recognition. The first described of these two varieties is that type which is common in Southern Europe and Egypt. It has long been recognized as the cause of extremely impoverished conditions of the blood, such as bricklayers' anemia, tunnel workers' anemia, miners' anemia, Egyptian chlorosis, etc. It rejoices in a multitude of names: *Strongylus duodenalis*, *strongylus quadridentatus*, *doehimus ancylostomum*, *doehimus duodenalis*, *sclerostoma duodenale*, *ancylostoma duodenale*, European hookworm, and Old World hookworm, of which the last three appellations are in most common usage.

The other form of parasite is one whose habitat is subtropical America and whose distribution throughout the southern part of the United States and the West Indies is very extensive. It is designated as the *uncinaria americana*, the *neeatur americanus*, the American hookworm and the New World hookworm. This parasite was observed by Stiles to present a sufficient number of minor structural modifications to justify its recognition as a separate species. The male parasite of the American variety differs from that of the European variety in being smaller in size; in the smaller size and more conical shape of the head; in having no hooklets on its oral rim but instead, on each side, a large ventral and a smaller dorsal chitinous lip, extending from the rim toward the median line; in a greater prominence and projection into the oral cavity of the dorsal conical tooth; in the size of the copulatory bursa, its dorsal lobe being subdivided and the ventral margin being so

extended as to form an indefinite ventral lobe; and showing the dorsal muscular ray of the bursa divided, each division ending in a bipartite tip. The female worm of the New World differs from that of the Old World in being shorter and more slender, with similar differences of the anterior end as just outlined for the male; the vulva is just in front of the middle of the body length instead of at the posterior curve as in *uncinaria duodenalis*. Neither time nor propriety permit of a detailed consideration of the anatomy of the hookworm; quite sufficient it is to note that there are differences between the two species which, while minute, are yet apparent; still, if any one is interested in probing more deeply into the structure of this worm, an excellent and very comprehensive description may be found in the monumental works of Leukart. The eggs of the two species are very similar in appearance, the chief difference being in the size, as those of the *ancylostoma duodenale* are larger than those of the *necatur americanus*. The life history of the two species is probably the same.

Human infection with this organism is known as *uncinariasis* or *ancylostomiasis*, a designation adopted by Bruns in the *Kolle and Wassermann Handbuch* as early as 1913. The seat of the infection in man is the small intestine, duodenum, jejunum, and the upper part of the ileum, where as many as a thousand worms have been found in one individual, although the average number rarely exceeds a few hundred. They do not multiply in the bowel, but individual worms may retain their residence for as long as five years. In the intestines, however, they do produce and liberate, into the lumen of the gut, eggs which are then passed on out of the alimentary canal by evacuation of the bowels. These ova pass out with the feces and, under favorable conditions of temperature and moisture, develop an embryo which hatches within a few days. The resulting larvae pass through a stage of development in the warm moist earth, growing to a length of 0.5 to 0.6 mm., and moulting twice. They are now ready to infest a new host. Very old females may fail to produce eggs.

The greater frequency of this infection in some of the southern states, especially those bordering the Gulf, is due to the economic and social conditions that prevail there. There are comparatively few cities of any size, and much of the population, in Louisiana and Mississippi at least, is scattered sporadically about, living in isolated log and box houses for the most part. These houses, in many instances, have crevices so wide that one riding along the road at night can often see, without an effort, what the individuals in the illuminated dwelling are doing. Amid such conditions, lack of personal hygiene and more or less absolute filth exists. Not only the negroes but also a great many

of the so-called "poor whites" go about barefooted; and, further, because of the distance between houses, indolent tendencies and lack of proper training, defecate at their convenience and inclination.

If, then, we consider the habits of many of the people in the districts where this condition is prevalent, in connection with the life cycle of the hookworm, we can readily understand the occurrence of uncinariasis. The hookworm eggs are discharged with the feces on the ground and, in the soil, they develop into the infecting stage when they are able to penetrate the skin. This penetration usually takes place through the thin, soft skin between the toes, giving rise to an inflammatory condition known as "ground itch." In this connection it is interesting to note that Smith believes that uncinariasis exists in every case where ground itch has occurred in the last eight years and that the disease is rarely present in those in whom this condition has not manifested itself in that period. After penetrating the armor of the skin, the infecting parasite probably follows the usual route described by Loos. The larvae are first carried by the lymph and blood to the lungs, where they are filtered out by the capillaries of these organs, penetrate into the pulmonary alveoli, pass up the bronchi, and finally get into the sputum and are coughed up. They are then swallowed, and the parasite thus reaches the intestinal tract where the adult worm attaches itself to the mucosa. The female then produces a great number of eggs which are discharged in the feces of the newly infected individual, so perpetuating the vicious cycle. Transmission by ingestion, through dirty hands, is not uncommon. Upon taking histories, it was further found that the habit of bathing in creeks or streams, when this luxury was indulged in, seemed to be responsible for the spread of the disease. By these means, ancylostomiasis has been liberally spread through some regions of the south. In fact, in some districts, its diffusion is extremely extensive. In 500 cases taken at random, Smith found this infection to be present in 3 per cent of the individuals.

The mode of diagnosis consists in the examination of the stool of the suspected individual for ova. This may be done by any one of a number of methods. The first, and consequently the most primitive one, consisted in the direct microscopic examination of fresh feces spread upon a glass slide. In severe cases eggs may be found by this method in nearly every microscopic field, but in comparatively mild infections it may be necessary to search as many as half a dozen slides, although they may sometimes be found on the first slide examined. While it seems probable from the estimate of Dock and Bass that ova will average at least one to the slide if ten or more laying females are present, yet the method is really quite cumbersome and comparatively crude

and, for this reason, has been little used since the development of the more recent modifications. One of the latter employs a series of graded sieves through which the fecal matter is washed by water. Each sieve is of a finer mesh than the preceding, and at each washing more excreta remains behind, until finally only the ova pass through the finest sieve and are subsequently collected on silk, while the debris only is retained. Any eggs present are then collected from the silk and subjected to microscopic examination.

Another device makes use of a petri disk containing an island of blotting paper, or heavy filter paper, upon which is placed some of the stool, surrounded by physiological saline solution. Into this the eggs gradually pass so that they can be observed in a drop of this saline solution, under the microscope, usually on the third day. Bass has taken advantage of density to "salt out" the ova by means of a solution of calcium chloride of a specific gravity of 1.150. The eggs are buoyed up by the solution and come to its surface, where they can be pipetted off with the supernatant. This is then diluted with water to a specific gravity of 1.050 and centrifuged. The ova are thus precipitated and may be found among the sediment removed for microscopic study. This method of salting out ova may be effected also by shaking up the feces with brine, straining through gauze, and permitting the filtrate to stand for an hour. The eggs, if present, may then be found by drawing off a drop from the surface for microscopic examination. Major Barber has utilized this principle in a much simplified technique, which is carried out as follows: A ring is described with a glass pencil on a slide; in the center of this ring is placed a drop of feces and as much Barber's solution as can be crowded into the circumscribed area. The two are then well stirred and the mixture allowed to stand for fifteen minutes while the eggs rise to the top of the center of the drop, where they may be detected with the low power. If suspicious objects are encountered, a coverslip is dropped on the slide and the preparation examined under the high power for confirmation. Barber's solution consists of:

	<i>Per cent</i>
Hypertonic (saturated) salt solution.....	70
Glycerine.....	30

The eggs of the hookworm have a tendency to cling to glass. Pepper has taken advantage of this fact in his method, which consists in placing a drop of feces upon a slide, washing it off and replacing it by another. This process is repeated a number of times, when a coverslip is placed over the drop and the preparation examined. The ova, if appreciable numbers were present in the stool, will then be seen, because they have

resisted being washed off the slide through their faculty of adhering to glass. Either of these last methods is very trustworthy, and both especially commend themselves because of their simplicity. One disadvantage of the latter method, however, remains to be noted, namely, that it is of value only in examining feces for evidences of hookworm, as the ova of other parasites do not stick to the glass and will, therefore, be lost.

The method outlined below is the one which we used in the Army. In our hands it proved very satisfactory. The stools were collected in waxed pasteboard sputum cups. A glycerine enema was given to the soldier if a specimen was desired at once. If this failed, it was repeated with a few drops of turpentine. This expedient was seldom found necessary, however. A part of a stool was transferred to a short length of glass tubing closed with a cork at the bottom, and covered with a strong brine. The cylinder was then corked at the top also, after which it was shaken thoroughly. The tube was then centrifuged at low speed for a few minutes, and then the upper cork was withdrawn. Due to their specific gravity, the eggs would be found floating on the surface of the brine and adherent to the cork, and could easily be transferred to a slide for microscopic examination. The use of glass tubing greatly facilitated the cleaning of our glassware.

When viewed under the microscope, the eggs are ellipsoid and have a thin, clear shell within which the yolk usually shows various stages of segmentation, although rarely the protoplasm may be undivided. It is interesting to note in passing that the degree of segmentation is influenced by age and climatic condition. The older the feces and the warmer the weather the more advanced will their segmentation be. This is especially true of the *uncinaria americana*.

Hookworm infection, rather to our surprise, was found present in a higher percentage in the poorer white classes than among the negroes, probably, however, because the white soldiers came from the sandy regions where *uncinariasis* is more prevalent, while most of the colored troops were gathered from the Delta region (near the mouth of the Mississippi). Of those infected, either white or black, over 85 per cent had not gotten beyond the seventh grade in school, and over 50 per cent of them admitted going about without shoes over a considerable period. A number of Porto Ricans examined all showed the eggs in their stools. In this connection it is quite significant to recall that Todd is authority for the statement that in Porto Rico 90 per cent of the rural population is infected.

In the generally accepted clinical picture, the cardinal symptoms are a severe and increasing emaciation, a variable but usually extreme



hyperleucytosis with a proportionate eosinophilia, and a general and somewhat progressive dulling of the acuteness of the mental faculties. The latter feature is illustrated, in a measure, by the educational data already mentioned. In the observation of the writer it was noted that those infected with the hookworm seemed to suffer very severely with acute infections, especially streptococcus pneumonia and measles, being also particularly prone to relapses and recurrences. It was further observed that, in the treatment of malaria, the cure of the latter parasitic infection was much retarded unless an associate hookworm infection was treated at the same time. A peculiar condition of arcus senilis was encountered among an appreciable number of young white soldiers. A very grave anemia is a common symptom of this condition and has given rise to the expression originated by Stiles, "anemia of the South," by which the infection is now commonly referred to. While our cases were accompanied in the great majority of instances by a severe anemia, yet there was a very considerable number of cases that gave a far milder blood picture than might have been anticipated. Further, despite the generally accepted belief that the blood picture is quite distinctive, eosinophilia, while present, showed no constant relation to the severity of the infection as judged by the condition of the patient.

The treatment was as follows: Infected individuals were sent to the base hospital in groups after their noonday meal. A dose of epsom salts was given early in the afternoon. At 5.30 the patients were given a thin broth for supper and, an hour later, another dose of epsom salts. The next morning, at 8.00 o'clock, they received still another dose of epsom salts, followed two hours later by a dose of 1 c.c. of oil of chenopodium. This in its turn was followed by a dose of castor oil in orange juice one hour later. In the middle of the afternoon liquid nourishment was given, and in the evening a full meal. Next day those who were able were permitted to return to their companies. At the end of a week the stools were reexamined. About 80 per cent were found negative. The remainder were obliged to repeat the treatment.

In the experience of the author, oil of chenopodium has given more uniformly satisfactory results than the frequently used thymol. Quite recently, Hall reports very gratifying results on dogs, horses, and swine, by the use of another vermifuge, carbon tetrachloride, which has been more efficacious in his hands than thymol, chloroform or chenopodium in causing the expulsion of blood-sucking strongyles; although it is less effective than oil of chenopodium in its action on ascarids. In its use among many thousand cases, there is on record a few human fatalities due to carbon tetrachloride, perhaps because, like chloroform, it may develop phosgen (carbonyl chloride) under

certain conditions. The question of attempting its use from analogy in the treatment of human beings is, therefore, a delicate one. To determine its effect, Hall himself (now at the age of about 40) took a dose equivalent to that which he had been giving to his dogs—the dosage for dogs is practically identical with that for man for nearly all anthelmintics—and, without observing any precautions as to food, smoking or exercise, followed his usual daily routine, with only negligible symptoms of discomfort. In addition, toxicity tests were performed at the Hygienic Laboratory of the U. S. Public Health Service on monkeys, which provide an excellent criterion of the toxic effect of drugs on man, with practically negative results.

On the other hand, however, with most other anthelmintics, it is advisable, if not necessary, to restrain the patient and cause him to rest and lie down—if he is not urged to go to bed. Again, carbon tetrachloride is much cheaper and more easily obtained than either thymol or chenopodium. Further, it is far simpler in composition than the latter and is therefore, presumably, also more constant in its action than oil of chenopodium, which is a mixture. Lastly, the fact that it does not depress unstriped muscle or lessen peristalsis, so far as it has been studied in this respect, would permit of an immense saving, by the omission of a purgative, in carrying on hookworm campaigns involving millions of people. The value of these last three points is obvious from an economic standpoint. It would seem that this drug promises much in the treatment of *uncinariasis*, and from the use of which much benefit may accrue.

Finally, it must be remembered that here cure of the disease lies in its prevention. Prophylactic measures are of much greater worth than therapeutic ones; a lay knowledge of how to prevent infection is of far greater value than a professional understanding of the curative measures applied to those already infected. The people of infested regions should be taught the mode of transmission of the disease and the danger of going unshod; an effort must be and is being made to educate them to decent principles of living and to sanitary habits. The importance of this is emphasized by some very recent studies in Trinidad on the activity and viability of hookworm larvae under natural conditions in the soil. The generally prevailing belief has been that the worms normally live enclosed in their larval sheaths and complete their second larval molt only at the time of penetration through the skin of their final host; that infective larvae may persist in the ground without loss of vitality and may migrate to a considerable distance from their place of development; and that, through these excursions, a small center may give rise to extensive soil infection. Such

beliefs were based upon observations of the parasite under artificial cultivation as its life history was studied in the laboratory. In fact, it was not until 1917 that Baerman brought forth his apparatus for isolating nematodes and made possible the effective study of hookworm larvae in their natural environment. By careful study under such conditions, Cort, Augustine and Payne have demonstrated that in the tropics the larvae very commonly lose their sheaths and continue to live actively, although usually only for a comparatively few weeks; and that migration of mature larvae is quite limited and the distance to which they penetrate from the center infection is consequently very circumscribed. In brief, the observations from the experiments of these authors may be summarized in the statement that, under tropical conditions at least, hookworm larvae die out quickly in the soil, and an area of even heavy soil infestation will soon become safe after the elimination of soil pollution. Hence the added significance of prophylaxis. In fact it is to a dissemination of knowledge relative to hookworm among the people that we must look for a final means of completely eradicating it as a human infection.

## REFERENCES

- Billings and Hickey: Jour. A. M. A., 1916, lxxvii, 1908.  
Bruns: Kolle u. Wassermann's Handbuch, 1913, viii.  
Cort, Augustine, and Payne: Jour. A. M. A., 1921, lxxvii, 2,035.  
Emerson: Clinical Diagnosis. Pa., 1914.  
Ferrell: Jour. A. M. A., 1914, lxii, 1,937.  
Frick: Am. Jour. Med. Sc., 1919, clvii, 189.  
Hall: Jour. A. M. A., 1921, lxxvii, 1,641.  
Pepper: Jour. of Med. Research, 1908, xviii, 75.  
Smith: Am. Jour. Med. Sc., 1903, cxxxvi.  
Soltan: Lancet, 1919, ii, 690.  
Stiles: Eighteenth Annual Report of the Bureau of Animal Industry, 1901; Pub. Health Reports, 1913, xxviii, 7.  
Stitt: Jour. A. M. A., 1912, lix, 1,706.  
Todd: Clinical Diagnosis.  
Webster: Diagnostic Methods. Pa., 1920.



## MANAGING THINGS

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RULE ONE is to manage the thing and not let it manage you.

Myriads of orders are issued, army regulations and manuals are compiled, and almost innumerable circulars and memoranda published for our instruction, direction and guidance, but not a word on this all-important and most essential factor to success—namely, managing things; and, boiled down, this simply means managing people. The latter looms up impressively, is always present, and is the vital thing whether one is running a company, regiment, division, hospital or what not, in the military service or elsewhere. It is a subtle, elusive thing, difficult to describe, requiring for its understanding not only common sense but, I might say, a sixth sense. Leaders, great and small, possess it, and in essence it might be stated that the art begins and ends in knowing your man. It constitutes and *is* leadership. Let us then proceed to an analysis of this complex subject and attempt to discover what it is made of, whereof it is born. What is said here pertains to officers generally, but the same principles apply to management of the noncommissioned officers and men as well, with perhaps slight modification.

As the head comports, so does the body. The head must be right, and if it is not so the body cannot be right. The body reflects the head, and so we find that, given an efficient organization, one is sure to find an efficient leader and wise and sagacious management.

We find, then, that the head or officer in charge of a military unit or institution is all-important. He is furnished with personnel, officers and enlisted men and his tasks assigned. He is charged with certain responsibilities under the regulations and clothed with the necessary authority thereby. He is furnished human clay to work with, it is his job to mould, fashion and develop it; the latent power is inherent there—I mean in the personnel—and it becomes his business to bring it out, develop it and translate it into efficiency. But he is dealing with many men of many minds; many types and temperaments are represented. While his treatment on occasion must be individualistic, at the same time he must first get the crowd with him. This becomes his first important duty. When it is accomplished other little inequalities will smooth out naturally, and the recalcitrants and unconvinced will become convinced.

But how does one get the crowd with him? The answer is justice

—inexorable justice. He must be a supreme court and absolutely neutral. He must instantly be able to dissociate the personal and the official. He must ever remain personally cordial to all of his associates and at the same time in all official decisions be led by his head and not unduly influenced by his heart. He should strive to remain neutral as between factions should they develop, but it is his business to see that they do not develop. Once demonstrated that everybody is getting a square deal, general harmony is established and everybody is on a plane of mutual understanding and confidence.

So much, then, for a good start. But the place other than heaven is said to be paved with good intentions, and the genus homo is not universally endowed with the disposition to work. Work, the greatest thing in life; the salvation of mankind. So you quickly perceive that the next problem that confronts you is to get this well-intentioned personnel to work, each to do his part according to his talents. As master of the vineyard you are the mainspring, the inspirational head. You conceive the plan, and it must be a practical one or otherwise it will fail, and the nature of your appeal to the rest of the team must be such as to arouse their interest and enthusiasm, stimulate their latent powers and enlist their sympathetic cooperation and support. Big-stick methods should be held in abeyance and are at best of doubtful utility, except possibly in cases of the most flagrant violation of the code in basic matters involving honor and integrity and military discipline. But even so, while justice should be swift in these cases, one must go slow so that no injustice will be done. In other words, the leader should try to lead rather than drive, since resort to driving methods tends to impugn one's qualifications of leadership and undermines his power accordingly. One must remember that kindness, consideration and forbearance are the most powerful levers in the world with which to move men. But then again, to resume, the subject of how to get them to work hobs up like Banquo's ghost to plague us. The fundamentals and key to this important phase are conceived to be as follows:

1. *Confidence and Support of Military Superiors.*—Prestige here enhances one in the opinion of subordinates; without it the influence and power of the leader is weakened. Confidence and support of subordinates must be secured, otherwise the goal cannot be reached.

2. *Delegation of Work.*—Ability to delegate work is the essence of executive capacity. The boss plans, coordinates, supervises, keeps ship on an even keel, advises and counsels, keeps his department on friendly relations with other departments and tries to use foresight of whatever nature required to secure successful operation of his depart-

ment. Adroit handling of people and situations, avoidance of intrigue and pitfalls, are among his important duties. He should studiously and strenuously avoid work of a routine nature. With a proper appreciation of his functions and responsibilities he will be kept sufficiently occupied. It is quite probable that there are assistants quite as capable to do the work, and furthermore, is he not training his various assistants for positions similar to the one he himself holds?

3. *Imposition of Responsibility upon Those to Whom Work is Delegated.*—This feature must be stressed, and the individual affected must be made to appreciate and feel his responsibility. This is difficult and requires instruction, training, and frequently some form of disciplinary pressure.

4. *Endowment with Authority of Those upon Whom Responsibility Is Placed.*—This goes hand in hand with responsibility, and those upon whom the responsibility rests are provided, under the regulations, with the necessary authority over their subordinates to compel compliance with their instructions. When placed in charge, the officer or noncommissioned officer should be supported right across the board; he should not be interfered with or heckled but should be encouraged and every effort made to develop him and capitalize his initiative. If he should happen to get off on the wrong track, he should be kindly advised but never humiliated or injured; if misplaced, he should be relocated and tried out in another position. He will usually fit in somewhere.

5. *Supervision and inspections* are very necessary and analogous to "follow through" as known in all athletic sports, be it baseball, tennis, golf, etc. High efficiency and smoothness of operation do not result spontaneously, and while it is said that a watched pot never boils, my observation has been that if you don't watch it it boils over and messes things up. The heads of your departments and sections are your supervisors, but they themselves require supervision, and this is done by you, yourself, or some immediate assistant on whose judgment and tact you can rely. Your assistants are familiar with your ideas and policies and in a measure they are clothed with your authority. Supervisors and inspectors should have a full understanding of their proper function and duties. It is their business to observe methods and efficiency of operations, find out whether orders and instructions are being carried out, observe state of morale and mental attitude of personnel, and keep in cordial rapport with the heads of the departments being supervised. Criticism by them should be constructive and not destructive—if conditions are rotten the inspector should so state, but he should never use the superlative when the comparative or positive

only are honestly applicable. He must not discredit superiors in the presence of their subordinates; he must suggest, counsel, advise and instruct, pointing out defects and indicating methods of remedy. In getting action, he must consider the constitution of the patient, so to speak, selecting and applying remedies largely in accordance with the psychological aspect of the situation and with regard to the temperament of the person with whom he is dealing. He must be firm, determined and insistent, but yet kind, except possibly in extreme cases where harsh measures are plainly necessary, under which circumstances he may assume the dramatic, avoiding, however, sarcasm and personal abuse, thus endeavoring to secure willing compliance and cooperation rather than to arouse resentment. In other words, if a man is worth keeping in a responsible position he should be fully supported and assisted; if you decide that he cannot do the job justice, it is your business to get rid of him, at least in so far as that particular job is concerned.

Now while we have been sailing along serenely in theory, in practice we perceive that there are certain members in our group who have failed to get the big idea and who are not hitting the ball—that is, not working. It now becomes our duty to render specialized care and treatment to these unfortunates. Men are simply grown-up children and subject to similar reactions. Here we take our cue and endeavor by various expedients to control or modify the destinies of those committed to our care, and success here depends upon our honesty of purpose, tact, judgment and determination. This is an inescapable responsibility which has been too little appreciated and emphasized but nevertheless attaches to all officers alike. In pursuance of this thought we find that some are organizers and others disorganizers, and while there is a tendency to throw up the sponge and say that the latter class are perverse by nature and beyond reclamation, there is still left a lurking suspicion that our system of training is defective in this particular and that the principles involved can be taught and absorbed in the same manner as that of the art of salesmanship in large department stores and in commercial life.

I have grouped some of the expedients upon which we rely to get results under three headings: (1) spurs, (2) prods, and (3) super-prods or the big stick, each of which has its own special indications and sphere of usefulness, its own language and significance.

#### SPURS

1. *Praise and Commendation.*—Once I knew a commanding officer who had a great habit of praising his officers to spur them on to greater

endeavor; when he ceased to praise, you knew that you were slipping and that sterner methods would be forthcoming. He fully understood the psychological value of praise and used it freely.

2. *Arouse Spirit of Emulation and Competition Among Officers.*—An instance in point is the weekly journal club, a function which requires officers to brief and present articles from the various medical journals. The psychological setting is such that the officer is thrown entirely upon his own resources before his fellows, and an honest effort on his part results. Incidentally he is working.

3. *Appeal to Pride.*—Many a worthy man who has been careless or negligent will, upon slight intimation from his commanding officer, execute a right about and furnish the goods. On one occasion during the strenuous days of the war, the commanding general happened by a mess for which a certain officer was responsible. Attracted by the poor state of police outside of the building and about the grounds, he decided to enter. He found things worse inside and so stated officially in a long list of deficiencies, ordering in a most peremptory way their immediate correction. However, it was noted that the communication was rubber stamped with the expression "Informal. No record." He got the expected response from the officer affected, and got it promptly, too. The kitchen crew worked all that night and the next day, and when the commanding general returned several days later he was so impressed with the general excellence of the mess that he decided to remain and eat dinner there.

4. *Promotion of Esprit de Corps and Morale.*—Tradition is a minor characteristic of our *esprit de corps*, and while we have had illustrious forbears in the various branches of the service and are duly inspired by their work, at the same time efficiency is the keynote in our army—efficiency in the man and in the organization. With attainment of efficiency we have good morale, and in the promotion of the latter we must keep in mind the three cardinal principles upon which it is based and strive for cultivation of them: Spirit of obedience to authority, spirit of work, and the spirit of cooperation. In this respect our path to the goal lies through instruction, training and discipline, and it is remarkable how important a factor habit becomes. It is probable that few of us realize how potent a factor the force of habit is in our lives. It is therefore the prime duty of responsible officers to provide the conditions and atmosphere conducive to obedience, work and cooperation, since they constitute the very heart of efficiency.

5. *Stacking the Cards to Make Them Work.*—Is it not the duty of the responsible officer to so arrange the work that all of his personnel will be kept busy? Can he not order drills, inspections, formations,



conferences, medical meetings, clinics, property checks, schemes of instructions for officers and enlisted force, etc., etc.? Can he not arrange a schedule along instructive and productive lines, looking to the development and perfection of his personnel? The recreational phase has been so stressed and carried so far in recent years that to make a man work has practically constituted a heinous offense against society. We must now retrace our steps and get a newer and truer viewpoint.

6. *Advantages and Effects of Conferences.*—A conference should be a conference in fact as well as in name, a forum where free discussion of pertinent matters should be encouraged and no one molested or made afraid. Aggressive souls should be permitted to tell their stories, if not too long. The chairman who is the senior should not openly dominate the meeting but should rather by his tact, adroitness and knowledge retain control, thus gaining the loyalty and esteem and the whole-hearted support and cooperation of his officers. The conference enables him to explain his ideas, motives and policies to his staff as it were in executive session. Its value from the standpoint of instruction can hardly be overestimated, and it affords a golden opportunity to secure teamwork, standardization of effort, coordination and cooperation.

7. *Proper Placement and Equalization of Work.*—These considerations have an obvious bearing upon the morale of officers and also their effectiveness. While a few have general adaptability, a large percentage have to be fitted into their appropriate places in the machine in order to get the best results, both for the individual worker as well as for the machine. Equalization of work both as to volume and number of hours is also a matter to be considered since disparity in this respect leads to dissatisfaction. The free use of rosters covering certain classes of duties will be found useful in apportioning work on a basis of equity.

8. *Value of Personal Talks.*—When the commanding officer sends word to an officer that he desires to see him in his office, the officer concerned instinctively feels that he is being haled before the bar of justice for sins of commission or omission. Many times this is the case, but not always. It does, however, indicate that his work is being observed by his superior and enables the commanding officer to give the officer plain and explicit instructions as to his desires. Not only does the commanding officer get prompter and better results upon specific points mentioned in such a conference but a more or less lasting result accrues, which keeps the subordinate on the alert in the future. It is not only the duty of the superior to reprove but also to encourage, by precept, counsel and advice, his subordinates to overcome defects.

It sometimes develops that the milder measures, similar to those

mentioned above, do not suffice, the desired results have not been attained, and we are compelled to resort to sterner and less diplomatic measures, that is, to prods.

#### PRODS

A prod is a poke, which leaves no doubt in the mind of the recipient that the author deliberately intends censure and rebuke. Prods are in the nature of sharp reprimands but are still corrective in purpose and do not signify that the person reproved cannot reestablish himself in favor. They include:

1. *Letters of reproof* in which the superior directs the officer under censure to explain by indorsement thereon the reason for such and such dereliction. Sometimes nothing further is said by the commanding officer; however, it is not forgotten. Sometimes such a letter is returned to the officer under censure with the remark that his explanation is unsatisfactory and that the same will be filed with his record.

2. *Verbal Reproof*.—The commanding officer may decide to deal more directly and resort to verbal censure.

3. *Undesirable Details and Extra Work*.—There is no law to withhold a commanding officer from assigning officers who are not behaving themselves to undesirable details or to others requiring an increased amount of work. This is entirely within his discretion since he has the power of assigning his assistants to their respective duties.

4. *Disciplinary Powers of Commanding Officers under the 104th Article of War*.—Under this article the commanding officer of any detachment, company or higher command, for minor offenses, may impose disciplinary punishments upon members of his command without the intervention of a court-martial unless the accused demands trial by a court-martial. Disciplinary punishments under this article suitable for officers include admonition, reprimand, withholding of privileges for not exceeding one week, and restriction to certain specified limits for not exceeding one week.

It sometimes develops that in spite of all humanitarian methods, inspirational, corrective or coercive, a point is reached where decisive action must be taken or the general standard of conduct and efficiency lowered to such an extent as to amount to demoralization. There is no choice left, intermediate methods having proven to be futile, and super-prods or the big stick have to be applied.

#### SUPER-PRODS OR THE BIG STICK

1. In the Medical Department, failure to pass examination for promotion for reasons other than disability results, in the case of lieutenants and captains, in discharge from the service with one year's

pay, and, in the case of majors and lieutenant colonels, suspension from promotion for one year, with reexamination and retirement with pay of grade if not successful in the latter.

2. *B Classification*.—Once yearly, classification of all officers of the Army is made in accordance with Sec. 24b, Amendment to the National Defense Act, approved June 4, 1920, and they are arranged in Class A, consisting of officers who should be retained in the service, and Class B, of officers who should not be retained in the service.

3. *Court-Martial*.

While certain of these eventualities may not necessarily lead to separation of the officer from the service, they at least result in great discouragement and loss of prestige.

The purpose of this article is to attract the attention of officers to the obligation which they owe to their employer, the United States of America, to require on the part of all subordinates a day's work for a day's pay. If they fail to do it, they are also faithless to the interests of their subordinates, be they officers or enlisted men, since they are in a great measure responsible for their training, development, progress and final success. The recent Class B legislation, which is a protest against this condition and a great advance, will not prove to be a panacea unless officers generally awaken to a deeper sense of responsibility in this connection and show the necessary force of character to state with justice and without equivocation their convictions, when reporting upon the efficiency of subordinates. The fault lies not in the law, or in the conditions, but in ourselves, that we have incompetents, and any successful system of development and improvement must come from within.

## NOTES ON THE HISTORY OF MILITARY MEDICINE

(Continued from April, 1922)

BY LIEUT. COLONEL FIELDING H. GARRISON

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### VII. THE EIGHTEENTH CENTURY

THE 17th Century, a period of almost continuous wars, of intense individualism in science set off by a distinct backward trend in practical medicine, was now to be succeeded by a phase of relative quiescence, interrupted at intervals by wars of brief duration, but tending, in the end, to a social order in which everything was to be regulated by sober-sided method and system. It was the illusory resting stage of apparent contentment with "the best of possible worlds,"<sup>1</sup> which preceded the stormy years of the French Revolution and the Napoleonic Wars. Carlyle characterized the 18th century as "spendthrift, fraudulent, somnambulistic, bankrupt," tending naturally to its suicidal end; and there is much in his formula for the general law of its being: "Souls extinct, stomachs well alive."<sup>2</sup> In this artificial, somewhat shallow and highly materialistic age, the powerful and prosperous enjoyed a degree of elegant leisure almost inconceivable today, and only comparable with that of the later Roman period; but underneath the veneer and varnish, the miserable status of the less fortunate can be definitely sensed from the Hogarth drawings, the novels, memoirs and police records of the time. The solemn, lengthy, cadaverous faces of the 17th century give way to the ruddy, heavy-jowled, eupeptic personalities of the three-bottle men.<sup>3</sup> Each person had a definite place in the scheme of things, and in it he was expected to remain. Medical practice was passed on from father to son. Doctor, lawyer, divine, soldier, courtier, tradesman, had each certain peculiarities of costume, manner

<sup>1</sup> Leibnitz emitted the famous dictum "*Tout est pour le mieux dans le meilleur des mondes possibles*," ridicule of which was the motive of Voltaire's "*Candide*."

<sup>2</sup> It is to be noted that this is the viewpoint, not of the professional moralist or clergyman, but of the sardonic humorist that Carlyle happened to be. To the conventional-minded, the 18th century is the ideal and idyllic period of sober quietism and virtue rewarded, as sensed in the Mozart or Haydn symphonies, the Handel oratorios, the Reynolds and Gainsborough canvases, the literary productions of Addison, Goldsmith, La Fontaine, etc. The history of the hospitals, psychiatry, infant mortality, and poor-laws, tells a different story. The poetry is artificial; the music "tailor-made." Bach lived in the 18th century, but his music is of the 17th century in its deep religious feeling and its ineffable sadness—a requiem for those lost in the Thirty Years War. Stendhal (Napoleon's quartermaster) lived in the 19th century, but is a typical 18th century figure.

<sup>3</sup> Gibbon was an corpulent that when he proposed to Mademoiselle Curchod, he was unable to rise from his kneeling posture. Chodowiecki's etching, "A physician's proposal of marriage," summarizes this phase. The Romeo is stout; the soubrette stouter.

and intonation that identified them, like players in a stock company,<sup>4</sup> and even knaves and blackguards acted up to their respective parts with aplomb and precision. Extreme servility in dedicating books and in other approaches to noble patrons was regarded as correct procedure. The advent of such dynamic, independent personalities as Frederick the Great, Dr. Johnson, Edmund Burke, John Hunter, Napoleon or Beethoven was as a series of shocks of high voltage to a society that permitted Mozart to starve and to be kicked downstairs by an archbishop's lackey. Oliver Goldsmith noted with precision the birth of a more modern trait, that of snobbery. As among the Romans of the Empire, the sexual and sentimental life of the time was a purely physical phenomenon, and though sincere private affection may be sensed in the lives of the "happy few," the general pursuit of carnal recreation was methodistic, systematic and hard as nails.<sup>5</sup>

In medicine, the mania for formal theories and methodistic systems ran an extraordinary pace, although this century was, financially and socially, the "Golden Age" of both practising physician and quack. Haller, Boerhaave, Stahl, Hoffmann, Cullen, Barthez, Borden, John Brown, had each an artificial "system" or way of looking at disease, all his own, and by which he diagnosed and prescribed for his patients' troubles. Private or secret remedies were the vogue; any formula that "worked" in practice was jealously guarded, as part of the pedestal upon which the physician stood with reference to his particular "theory" of disease. Yet there were clinical advances of extraordinary significance, which can only be appreciated in relation to their modern applications.

Floyer published his "Pulse Watch" in 1707. Martine and Currie introduced clinical thermometry (1740-98). Auenbrugger discovered the art of percussion (1761). The Hahn family introduced the use of the cold pack in fevers and Currie himself gave cold baths in typhoid. Withering introduced digitalis. Galvani, Volta and Franklin furnished the means for electrotherapy. Heberden, Fothergill, Lettsom, Parry, Huxham, Baker and Pringle added to the luster of English medicine by their close notations of new diseases at the bedside. More diseases were accurately described in this period than ever before.

<sup>4</sup>Of this amusing phase, there are endless examples in the waspish antitheses of Pope, e.g.,

"Boastful and rough, your first son is a Squire;  
The next a Tradesman, meek and much a liar;  
Tom struts a Soldier, open, bold and brave;  
Will sneaks a Scriv'ner, an exceeding knave;  
Is he a Churchman? then he's fond of power;  
A Quaker? sly; a Presbyterian? sour;  
A Smart Free-thinker? All things in an hour."

<sup>5</sup>Latinus tests of this proposition are: the fiction of the entire period, from *Clarissa Harlowe* to *Faust*; the drama prior to Goldsmith and Sheridan; the moralities in Rousseau, Hogarth, the one realistic artist of the time, the early youth of Frederick the Great and his final phase, the epitaph of Francis Charteris; the *Pare aux Cerfs* and its relation to the French Revolution. It is highly significant that Frederick the Great (certainly no moralist) could have had Russia as his ally in the Seven Years War, had he not dubbed the Czarina "*l'infâme catin du nord*."

Gross pathology became a science at the hands of Morgagni (1761) and Matthew Baillie (1793). Jenner introduced preventive vaccination (1796-98) and first described anaphylaxis (1798). In forwarding the technic of operative surgery, France took the lead, even beyond the time of John Hunter, the founder of experimental surgery. The management of obstetric cases was vastly improved by William Hunter, Smellie, Charles White and others. Brisseau, Maitre-Jan and Daviel developed our present knowledge of cataract and its treatment. Anatomical illustration in copper and steel attained the heyday of its perfection. The true physiology of respiration (hinging upon the discovery of oxygen) was developed by Black, Priestley, Lavoisier, La Place and Lagrange (none of them medical men); and the science of blood-pressure owes its origins to Stephen Hales (an English clergyman). Ramazzini wrote the first book on industrial diseases (1700) and Frank the first scientific treatise on public hygiene (1777-78).

In the 18th century, the administration of military medicine became a definite function of government, and, in consequence, limited periods of voluntary enlistment, regular medical examinations of recruits, regular salaries for officers, government quarters for troops, regular uniforms, a common daily ration, the military regulation of army hospitals, printed orders and bulletins on military paper, periodicals devoted to military medicine, and regular schools of military medicine (in Prussia and Austria) became part of the established order of things.<sup>6</sup> Thus military medicine profited by the 18th century cult of formal systems and elaborated routine.

Infantry was now armed with fire-arms exclusively, and through the hard cogitations devoted to the art of war by Prince Leopold of Anhalt-Dessau and the Maréchal de Saxe, it acquired great efficiency. Martinet, whose name is synonymous with formal meticulous precision, introduced regularly planned camps (1667), the use of the bayonet (1669), the organization of infantry *culres* by companies and battalions, pontoon bridges, newer tactical evolutions, etc. Of the elder Dessauer, Carlyle observes: "He invented the iron ramrod; he invented the equal step; in fact, he is the inventor of modern military tactics. . . . The soldiery of every civilized country still receives from this man, on parade-fields and battle-fields, its word of command; out of his rough head proceeded the essential of all that innumerable drill-sergeants, in various languages, daily repeat and enforce."

Of the effect of Frederick's methods of volley-firing at close range upon relief of the wounded, Straub says:<sup>7</sup>

<sup>6</sup> Limited periods of enlistment, first recommended by the Maréchal de Saxe in 1732, were definitely adopted by Venice in 1766, and by England in 1775. Medical examinations of recruits for militia were customary in France from 1726 to 1775; in England an inspector-general of recruiting for foreign service was appointed in 1773, but there were no regular medical examinations until 1790, and no written attests until 1799. Examinations were first authorized in Germany in the Prussian regulations of 1788. Salaries of medical officers, even of the Prussian surgeons general, were fluctuating, precarious and sometimes non-existent for a long period. Billeting on civilians was prohibited in England in 1745, but persisted elsewhere until late in the century, and was not abolished in Scotland until 1857. Building of barracks began with Vauban in 17th century France, and was started in England in 1739. Uniforms were introduced in France by Louis (1670-79). The first governmental hospital regulations were French (1718). For specimens of printed government orders see the facsimile reproductions in Cabanes (*Chirurgiens et blessés*, Paris, 1918, *passim*).

<sup>7</sup> Carlyle: Frederick the Great, Book IV, ch. 2.

<sup>8</sup> Straub, Medical Service in Campaign, Philadelphia, 1910, 87.

"During the time of Frederick the Great, troops advanced into battle, shoulder to shoulder, to within 200 yards of the enemy, and sought to overcome him by superiority of fire, and the contestant that could fire most rapidly had the best chance of being successful. Open ground was chosen by preference and the rescue of the wounded during the progress of the engagement was out of the question."

Throughout the 18th century, France, in consequence of Louis XIV's campaigns, became the "great nation," and was everywhere regarded as the centric authority in literature, painting, architecture, science, medicine, surgery, etiquette and the art of war.

### *Military Medicine in France<sup>9</sup>*

The first important advance made in French military medicine dates from an order of Louis XIV (January 17, 1708), which specifies that, in future, sick and wounded officers and soldiers shall be attended on the march and in hospital by a personnel of 200 physicians and surgeons, previously tried out by appropriate examinations, and consisting of 4 medical inspectors general, 50 advisory physician majors (*médecin-majors*) for hospitals, 4 advisory surgical inspectors general, 4 surgeon majors of camps and armies and 138 surgeon majors. At the same time, military hospitals were erected in 51 French cities. Commissions for grades were sold to applicants, but the harmful arrangement was nullified in a royal order of Louis XV (1716). The first hospital regulations, a document of 62 paragraphs, was issued on December 20, 1718, and became the basis of all similar regulations in France. It contains clear and exact directions as to the duties of hospital personnel, medical treatment of patients, hygiene of attendants, administrative control of subaltern functionaries, and prevention of contagious diseases. Yearly courses in anatomy are prescribed for surgeons, and a garden of medicinal herbs is to be attached to each hospital from the date of construction. The making of wills by dying patients in favor of an institution, an order or an interested person is forbidden. An order of 1719 fixes the monthly pay of medical personnel as follows: physician in chief, 500 livres, 10 rations of bread; consulting surgeon, 150 livres, 10 rations; chief surgeon, 390 livres, 6 rations; principal assistant surgeon, 150 livres, 4 rations; sub-assistant surgeon, 60 livres, 3 rations; boy (assistant), 50 livres, 2 rations; chief apothecary, 120 livres, 4 rations; apothecary's boy, 50 livres, 2 rations. In the field, chief physicians and surgical consultants got 1,500 livres for their equipment, and a bonus of 2,000 livres at the end of the campaign. These regulations were re-edited, in compressed form, in 1728, and on January 1, 1747, appeared a new royal order, combining the main features of both, and destined to be rescinded and reaffirmed at intervals throughout the century. The principal defect of this new order was the creation of a *Commissariat de guerre* (intendance) to usurp the legitimate functions of medical personnel. While this was ostensibly designed to circumvent peculation by contractors (punishable first by 1,500 livres fine, second by 9 years hard labor in the galleys), it had deplorable consequences for the actual relief of the sick and wounded, even to the end of the Seven Years War, by reason of the fact that the hospitals and ambulances of the first line were financed from the king's privy purse, those of the second line by the *entrepreneurs* or contractors. At the end of the Thirty Years War, there appeared a serial designed to advance the interests of military hospitals, edited by Richard de Haut-Sierk, Inspector General of Hospitals, and entitled *Recueil d'observations de médecine des hôpitaux militaires* (1766-72). This was followed by the first periodical

<sup>9</sup> G. Marache: *Diet. encycl. d. sc. m'd.* (Dechambre), Paris, 1877, 2. s., VIII, 79-97, Cabanès, *Chirurgiens et blessés à travers l'histoire*, Paris, 1918.

to be devoted to military medicine, viz., the *Journal de médecine militaire* (Paris, 1782-88), which was revived at intervals as a *Recueil* in 1814, 1817 and 1871. During the period 1747-92 there was uninterrupted warfare between the physicians, surgeons and commissariat of war, which manifested itself by many changes in orders. Thus an order of August 1, 1772, prescribes a Commission with exclusive control of the medical personnel, consisting of an inspector general, 5 medical inspectors and 2 surgical ditto. It was rescinded by an order of August 17, 1774, and the old arrangement of January 1, 1747, was resumed. A royal order of 1775 authorizes the opening of lecture rooms for instruction in military medicine in the hospitals of Metz, Lille and Strassburg. This, the first attempt at an army medical school, had later developments at Brest and Toulon. In spite of this advance, the status of medical officers was still feudal. Louvois, the great minister of Louis XIV, and creator of the royal "standing army," endeavored to overthrow the proprietary system of mercenary forces (each regiment for hire and the exclusive property of its colonel) by giving wealthy young nobles the empty title of "colonel," or "captain," while the real work was done by lieutenant colonels or lieutenants. By this arrangement, commissions and regiments could no longer be bought, but the result was a commissioned force of juvenile officers of high grade, which blocked promotions for a lifetime, while chief physicians or surgeons were still arbitrarily selected as vassals by these swaggering young courtiers. The educational order of 1775 was again abolished on January 1, 1780, as incurring unnecessary expense to the state. In 1788, regimental hospitals were substituted for the general military hospitals in vogue, with a host of new instructions and regulations. An order of May 18, 1788, embarked upon the dubious course of assigning control of military hospitals to a directorate made up of military and medico-military members, with a sanitary council (*Conseil de santé*) as adjunct. But before this (with three subsequent modifications) could be tried out by test, the whole edifice was swept away by the French Revolution (1789). The first act of the Constitutional Assembly was to abolish, in 1790, an edict of 1784, by which commissioned rank had been reserved for the aristocracy alone. This put new blood into the artillery and engineer schools, and from this class came Napoleon and some of his best generals. The Republic declared war on Austria on April 20, 1792. The armies created for this purpose by the revolutionary general Carnot, first by enthusiasm later by remorseless conscription, were destined to raise the military reputation of France to the highest point, and, under Napoleon, to obliterate the older 18th century plan of making war by set principles and mechanical rules. At first, whole columns of the Republican troops melted away under the steady fire of disciplined regulars, but the gaps in the ranks were speedily filled up, and no headway could be made against a "nation in arms" animated by ferocious patriotism. In contrast with previous wars, there were few desertions, since each private was also a patriot, and had a fanatical personal interest in the cause. At the outbreak of the war, 1,400 physicians and surgeons applied for entrance to the army, and many of these were lost by wounds or disease. By the law of August 1, 1793, the National Convention placed all physicians, surgeons and apothecaries at the disposal of the Minister of War. In January, 1793, 2,570 medical officers had been raised; by the end of the year there were 4,000; in 1794, a maximum of 8,000 was attained. Meanwhile in 1792, the 18 medical faculties and 15 medical schools of France had been abolished by vote, along with the Académie de chirurgie and the Société royale de médecine. In 1794, *Écoles de santé* or schools of military medicine, with the graduating degree of *officier de santé*, were created, in order to supply medical officers for the armies of the Republic. The effect of this device of mob rule (always fatal to medicine) was chaotic. Medical education could have no firm grounding nor any definite course under such an arrangement. Training was superficial, practice was thrown open to anyone who could pay for a license. An



actual specimen examination of a candidate of 1803, exhumed by Wickersheimer,<sup>10</sup> displays appalling ignorance. The evil was eventually checked by the firm hand of the First Consul, who restored the medical faculties to their proper status in 1804.

The principal wars of this century were the wars of the Spanish (1701-13), Austrian (1740-48) and Bavarian Successions (1778-79), the Seven Years War (1756-63) and the three revolutions in Russia (1773), America (1775-80) and France (1789-94).

### *War of the Spanish Succession*

In 1700, Charles II of Spain died and his successor was Philip of Anjou, grandson of Louis XIV. The view of the Grand Monarque that France and Spain were now one (*Il n'y a plus de Pyrénées*) brought about an alliance of England and Holland against him, under such overtopping leaders as Marlborough, the greatest English commander before Wellington, and the redoubtable Prince Eugene of Savoy. But after thirteen years fighting, with the memorable battles of Blenheim (1704), Ramillies (1706), Oudenarde (1708) and Malplaquet (1709) as victories for the Allies, the whole aspect of the question was changed by the succession of Archduke Charles of Austria to the throne of the Central Empire. This brought about a more dangerous possibility for Spain and thus left the Bourbon prince on the throne, with a dissolution of the Alliance, set off by the acquisition of Gibraltar, Newfoundland, Nova Scotia and the Hudson Bay territory by England and of Milan, Naples, Sardinia and the Spanish Netherlands by Austria. The English forces numbered 40,000, out of a population of 10,000,000 and the French 200,000 out of 20,000,000. These forces were recruited by voluntary enlistment in France and partly by impressment in England, but poverty was the great recruiter of armies at this time. Louis XIV observed that "hunger would compel his subjects to follow the bread-wagons." Troops on both sides suffered great hardships from the barren condition of the countryside. The English forces were therefore followed by trains of bread-wagons and cattle. In his thoughtful consideration for the health and well-being of his men, Marlborough was equalled only by Frederick the Great.

The introduction of a rhythmic, cadenced or metronomic step in marching exerted a profound effect on discipline and *esprit de corps* and enabled infantry to get over great distances without undue fatigue. Marlborough's celebrated march to the battlefield of Blenheim, covering 1,176 miles in 86 days, was accomplished by continuous movement during the cool morning hours (3-9 A. M.) toward a definite halting place, prepared and

<sup>10</sup> E. Wickersheimer: *Paris m'él.*, 1912-13, suppl., 749-851. Translation in *Jour. Am. Med. Assoc.*, Chicago, 1913, LXI, 2001. This affords an amusing, yet dreadful example of the flippancy and irresponsibility of popular rulings in regard to a subject so grave and difficult as medicine.

rationed in advance by commissaries, and where the rest of the day was spent in rest. The result was that his troops looked, in the phrase of the Elector of Prussia, "as if dressed for a ball." Marlborough did everything he could to discourage intemperance and debauchery in camp, tried to impress his men with a sense of morale and self-direction, held divine service morning and evening, read prayers before and after battle, by which and similar means, his camp "resembled a well governed city." Before the action at Blenheim, he took pains to have the surgeons shown the exact places for assemblage and care of the wounded. After the victory, he wrote to Godolphin: "I have been so employed about our own wounded men and prisoners that I have not had one hour's quiet." At the beginning of the campaign, it had been promulgated in the British Articles of War that one day's pay be deducted annually for the hospital, and that all plunder taken before the end of a battle be forfeited for the use of the sick and wounded, and that one-tenth of the total spoils be set apart for the same purpose. The losses in the four great battles of this war were heavy, viz.,

- 1704—Blenheim: Allies, 5,000 killed, 8,000 wounded; British, 670 killed, 1,500 wounded; French and Bavarians, 12,000 killed, 14,000 wounded, 14,000 missing.
- 1706—Ramillies: Allies, 1,066 killed, 2,867 wounded; French, 2,000 killed, 5,000 wounded, 6,000 missing.
- 1708—Oudenarde: Allies, 3,000 killed and wounded; French, 6,000 killed and wounded, 9,000 prisoners.
- 1709—Malplaquet: Allies, 20,000-30,000 killed, wounded and missing (Infantry, 5,554 killed; 12,706 wounded and missing); French, 6,000-16,000 killed, wounded and missing.

In all these actions, Marlborough shone as a great commander through his zeal for relief of the wounded. At Malplaquet, evacuation of the wounded and burial of the dead occupied two days. At Oudenarde, he broke the stereotyped rules of the "art of war" by forcing his tired troops, with their backs to a river, to destroy the enemy's right and centre under his very eyes. After nightfall, the field was covered with wounded, mixed with the dead and dying, and here again, Marlborough's ingenuity was taxed to the uttermost. Malplaquet he described as "a very murdering battle," for here thousands of his old comrades were destroyed. In these battles, it was sometimes necessary to break up the commissary wagons to make litters for the wounded.

### *Development of Military Medicine in Prussia<sup>11</sup>*

Until the time of Frederick the Great, the medical service of the Brandenburg armies remained on the 17th century level, with little evidence of the governmental supervision which had become a fixed principle in France after January 1, 1747.

Under Friedrich I, the first king of Prussia (1688-1713), company barbers were first subordinated to the regimental barber (order of November 4, 1712). Examinations to test the fitness of the latter had not been instituted before 1685. An order of November 4, 1712, authorizes the regimental barbers to choose and pay field barbers and to procure medicines. The first order for the location of appropriate sites for military hospitals was promulgated on March 10, 1704. The first regular military hospital in Prussia was a house near the Spandau gate (Berlin), set apart for the plague in 1710, and which was incorporated as the Charité by a royal order of September 5, 1725.

Under Friedrich Wilhelm I (1710-40), an order of May 18, 1713, specifies that regi-

<sup>11</sup> E. Knorr; *op. cit.*, 73-92. A. Koehler; *Veröffentl. u. d. Geb. d. Md. San., Wesens. Berl.*, 1899, Heft 13, 23-41; 129-262.

mental barbers shall have the rank and pay of subaltern regimental officers (a considerable advance in their then status), and shortly after his accession the monarch nominated the regimental surgeon of his guard, J. C. G. Brandhorst (1694-1740), to be general surgeon (*Generalechirurgus*) of the guard, at a salary of 15 reichsthaler monthly. During 1716-19, Brandhorst, Houness and Cassebohm were sent to Paris to study. The first Surgeon General of the Prussian Army was Ernst Conrad Holtzendorff (1688-1751), who received this honor in 1716. His success in treating the king during a grave illness in 1719 won the royal confidence, and through this circumstance the *Theatrum Anatomicum* (founded 1713) was expanded to include the *Collegium medico-chirurgicum*, for the higher instruction of medical officers, on January 3, 1724; and medical officers were sent to France and elsewhere to complete their medical studies, at government expense. In 1734, the king was gravely ill with gout and dropsy. In gratitude for the skillful handling of his case by Eller and other physicians, he presented 100,000 thaler to the *Charité*.

In the reign of Friedrich Wilhelm I, the Prussian army had increased from 30,000 to 76,000-89,000 men. The intense personal interest of this king in the medical corps is indicated by his instructions to the Surgeon General of January 30, 1725:

1. In the future, no regimental barber will be accepted or dismissed without prior knowledge of the king.

2. The applicant must appear before the Surgeon General; he must pass an examination before the *Collegium medicum* on his knowledge of internal diseases and absolve a course in operative surgery.

3. He must subscribe to his oath at the hands of the regimental auditor in the presence of the commanding officer.

4. In the cavalry, his pay will be 106 thaler monthly, of which he must disburse 6 thaler to the barber of each squadron (10 in all) and pay for outfitting the field-chest and instruments. In the infantry, he receives 12 thaler monthly from the staff and 10 thaler monthly from each company, out of which (latter) amount, he must maintain the company barber at 5 thaler monthly and disburse the remaining 5 thaler for medicines. The field-barbers are subordinated to him and can treat no patients without his knowledge and consent. In detached companies, their status is independent. Their duty is to shave the soldiers and to visit the sick.

5. The regimental barber will report to the commanding officer daily at 11 a. m. and at other hours in urgent cases.

6. In cases of death, he must conduct the post-mortem section in the presence of an officer, handing in his report, with summary, to the commanding officer.

7. The commanding officer will hand in a personal report to the King.

(A supplementary order of December 24, 1726, adds: Regimental-barbers but not field-barbers shall be allowed to practice internal medicine and surgery among the civilian population, and to write prescriptions in apothecary shops; their evidence on bedside and post-mortem data shall be accepted in court.)

The Infantry Regulations of March 1, 1726, specify the old rule of the Brandenburg Army that no relief of the wounded could be attempted until victory had been sounded by the trumpets: "When the battle is over, each regiment shall seek out its wounded and bring them to a definite place, where they can be bandaged and cared for; no wounded may be removed during battle." That this rule was not strictly in force is evidenced by the fact that Schmucker was wounded at Soor (1745) and Prague (1761) in line of duty. The same Instructions specify that "A military hospital shall be erected in the nearest town, to which the sick will be sent with a captain, a barber and two attendants from each battalion; should the army move on, a trusty non-commissioned officer shall be detached from each regiment, and supplied with money for the care of the patients,

The patients will receive medicines from the field-apothecary, who remains behind for the purpose. They are to be treated in hospital by special barbers, the troop-barbers having only to send patients to the hospital. The slightly sick may be transported by the baggage wagons, but never within the marching columns. They are in charge of the captain, who is personally responsible and must supply cooked food and bed covers (8 per tent). The barber must never leave his company on the march, he is responsible for the light sick and receives the necessary medicines from the regimental barber. The latter receives from each company 200 *Reichsthaler* and fodder for 4 horses. Barbers are overseered by the physician and the Surgeon General." In the same year (1726), the "medical-penny" (*Medizin-Grosschen*) was ordered to be deducted from the soldier's monthly pay for the use of the regimental barber, a species of tipping which was strongly disliked, as leading to peculation. An order of 1734 authorizes the construction of a great camp hospital for 600 patients.

### *Frederick the Great*

Friedrich Wilhelm I was thus the creator of the military establishment which was to accomplish such remarkable things under his son, Frederick the Great. The father, a typical Prussian bear of the old régime, was practically in the hands of the Austrian envoy, Seckendorf, who broke up the queen's "double-marriage" project of an alliance with England by holding out to the king an illusory promise of the succession of the duchy of Jülich and Berg. In consequence of this imbroglio, the son, and his sister Wilhelmine, were treated by their father with a cruelty and barbarity which surpasses anything of the kind in history. As Frederick's life was more than once endangered by the parental rigors, he learned early to dissemble. There can be no doubt that, when he came to the throne, he had one definite object in view, to break the power of Austria and of the old Empire. The death of the Emperor Charles and the accession of Maria Theresa gave him his opportunity, and with scarce a word of warning, he marched upon Glogau. The rich province of Silesia was easily acquired "by gentle pressure," for the native population favored the conqueror, much as the Milanese population favored Napoleon, when his entry into that city destroyed the power of the Spanish viceroys. But Silesia once acquired, it was another matter to hold it. In the first and second Silesian campaigns (1740-45), Frederick served his apprenticeship in the art of war and secured for himself his conquests and a peace of ten years' duration (1748). Meanwhile Maria Theresa occupied herself in mobilizing against him an unheard-of alliance consisting of Austria, France, Russia, Poland, Saxony and Sweden. In the Seven Years War (1756-63), Frederick, as Carlyle puts it, found "his world of enemies all come." The interest of his career at this point is that, however unscrupulous his acquisition of Silesia in the first instance, and although in no sense a soldier by original inclination, he succeeded,

with no ally except England (in West Prussia), in keeping this world of enemies at bay with a valor and dexterity never equalled before or since.

His principle of action was extreme rapidity of movement and a vigorous offensive. At Kolin (1757), Grossjägersdorf (1757), Hochkirch (1758) and Kunersdorf (1759) he weathered disasters any one of which would have ended an ordinary commander. Reassembling new forces with extraordinary perseverance, changing base and front with a swiftness which Macaulay has likened to "the desperate bounds of a hunted tiger," he defeated the French, Austrians and Russians successively in the battles of Rossbach (1757), Leuthen (1757), Zorndorf (1758), Liegnitz (1760) and Torgau (1760). The year 1761 found him facing ruin and at the end of his resources, when the death of the Czarina Elizabeth made the Russians allies instead of enemies. With these reinforcements he was able to conquer Silesia and end the war. The remaining twenty-three years of his life (1763-86) were spent in repairing the shattered remains of his kingdom.

The man to whom all this happened was a child of his time and, like others of his time, a bundle of strange contradictions. Through his mother, he was partly of French extraction, educated by French refugees in Berlin, French in his tastes and inclinations. His conception of government is summed up in his famous sentence: "The prince is not the absolute master, but only the first servant of his people," and it was through his fidelity to this program, as well as his competence in grappling with his evil star, that he was accounted "the great"—*le grand Frédéric*. Carlyle called him "the last of kings"; on his own showing he was the earliest public servant to give whole-time duty to the interests of a nation.

Frederick's success in arms was due to his capacity for forming swift decisions and acting upon them; partly to the fact that he was his own self-constituted cabinet, general staff and council of war and held all the reins of government. In his day, the "art of war" consisted, not of principles but of cut and dried rules, and success was held to depend not upon men but upon methods; able commanders were therefore hampered by rules as well as by subordination to higher authority. Frederick's own rule of "vigorous offensive" cost him dear at Prague and failed him completely at Kolin and Kunersdorf. The end of the second Silesian campaign, which had used up the flower of his fine army, left him with a definite aversion to the costliness and uncertainty of war. The Seven Years War, fought at the end with inferior troops recruited by force from conquered regions, left him warped, hardened and embittered, with a clear vista of the long distance travelled between his spoiled, unsatisfactory youth and the chill isolation of a mean old age, as depicted in his droll verses:

"Un vieillard glacé par les ans,  
Froid, taciturne et phlegmatique,  
Dont le propos soporifique  
Fait baller tous les assistants."

From his youthful days at Reinsburg, where he reported daily to his harsh parent about the health of his command, to his order issued one month before his death for a complete inspection of military hospitals, Frederick was perhaps the most active of all great soldiers in forwarding medical administration. His regard for medicine and physicians was small, due to the fact that he got little relief from the

many bodily ills that tormented him all his working life.<sup>12</sup> But he saw clearly that to waste men was to court defeat, since for an army fighting in four separate theaters of war, defeat always meant ravaging of his thinly guarded zone of the interior by hostile forces.—

"En père bienfaisant conduisez votre armée, . . .  
Tant que Mars le permet il faut les ménager."

He usually made his own dispositions for the location of field dressing stations and general hospitals (in neighboring towns) and was merciless in reprimand if his orders were not obeyed to the letter. Thus, at his instance, Cothenius organized the field medical service for the Seven Years War, with stationary general hospitals at Breslau, Glogau, Stettin, Dresden, Torgau and Wittenberg, field hospitals (*hôpitaux ambulants*) within call, and dressing stations, to be protected from enemy fire by locating them behind some convenient hillock or within a ditch, at the rear of the fighting columns. In siege operations a board booth or *Blessirten-Depot* was erected at the entrances to the breastworks, with standards one foot high for the imposition of litters; first aid was given by a regimental barber and four company barbers. Detachments for evacuation of the wounded from the field were always made from the regiments which had suffered most in battle (Instructions of 1748). Frederick's rule was first to relieve his own wounded, then those of the enemy, to whom he seems to have been most humane in his earlier campaigns. Thus after Hohenfriedberg, he sent Lesser, Bouness, the field apothecary and 50 hospital surgeons to relieve the 7,000 Austrian and Saxon wounded at Striegau, and visited them himself on June 5, 1741. After Mollwitz, concern for the wounded kept him 11 days at Ohlau. After Liegnitz, 500 dragoons were required to dismount to give saddle transportation to the wounded. On the bloody field of Kunersdorf, Frederick ordered rescue and bandaging of the wounded even before the end of the battle. As he was much given to doctoring on his own account, he insisted that his troops be purged and bled at intervals, treated dysentery with tartar emetic and ordered the use of vinegar in

<sup>12</sup> These were: gout, haemorrhoids, constipation, indigestion, asthma and the sequels of venereal and malarial infections. Like many people of small physique, he was immoderately fond of the pleasures of the table, and usually ignored the dietetic counsels of physicians, probably because the gouty diathesis persisted even during abstemious periods. His menu cards at Sans Souci were of portentous length and variety. Another great handicap for a general in the field was his emotional temperament. He was an exquisite musician, esteemed even today as a composer of chamber-music, turned out yards of indifferent French verses and was profoundly shaken by the deaths of near relatives. With this exaggerated sensibility, he ran the gamut of such tremendous emotional experiences as the victory at Leuthen and the reverses of 1759-60. In time of peace, he was on duty from 4 to 5 a. m. until nightfall. His exertions over state-papers and drilling troops were, in Macaulay's phrase, "such as are hardly to be expected from a human body or a human mind." After death, the body had shrunken to infantile proportions.

water on marches in hot weather. In 1746, he presented 40,000 thaler to the Charité; founded the *Invalidenhaus* for instruction of medical pensioners or cadets in 1748; increased the number of garrison hospitals (1765) and the number of pensioner-surgeons, from 9 to 16 (1779). In July, 1786, one month before his death, he ordered a thoroughgoing inspection of all military hospitals, with a view to reorganization and better luck for the wounded. This reform was carried into effect during the reign of his successor, Friedrich Wilhelm II (1786-97).

### *The Prussian Surgeons General*

In 1746, Holtzendorff was appointed Surgeon General, body-physician to the king and "director of all surgeons in the Prussian lands." Eight years later (1754), Johann Theodor Eller (1689-1769), a skilled physician and chemist, was appointed Field Physician in Chief, presiding over all physicians (*medici*) and general medical practice in the army, as Holtzendorff presided over surgery and sanitation. This dual arrangement, effect of the old-time divorce between medicine and surgery, was yet regarded as a distinct advance for surgery, since surgeons now received the same training as physicians. It persisted throughout the 18th century, but was put to no particular test of merit until the first Silesian war. While obviously faulty, as tending to decentralize administration, it could have had little effect either way in Frederick's campaigns, for the latter himself made all dispositions for relief of the wounded, location of hospitals, etc., in his battle-orders. In 1746-7, J. H. Bonness was appointed to succeed Holtzendorff as Surgeon General, and after serving through the earlier period of the Seven Years War, died in 1758. About the same time (1757-8), Eller, the Physician in Chief, was found to be incapacitated for service in this campaign by age and Christian Andreas Cothenius (1708-89) was appointed General Field Staff Physician (*Generalfeldstabsarzt*), with Ludolf (1757-63)<sup>12</sup> and Zinzendorf (1763-89) as subalterns. Some-time before Bonness' death, and on account of enlargement of the army and the fact that separate detachments were fighting in several theaters of war, the king appointed Johann Leberecht Schmucker (1712-86) and Johann Ulrich von Bilguer (1720-96) as second and third surgeons general. Upon Bonness' death (1758), Schmucker, Bilguer and J. A. T. Theden (1714-97) became first, second and third surgeons general respectively. When Schmucker died (1786), the arrangement became 1. Theden, 2. Bilguer and 3. J. C. F. Voitus. When Bilguer died (1796), it became 1. Theden, 2. Mursinna, 3. Johannes Goercke (1750-1822). Finally when Theden died (1797), Goercke was appointed Chief of Military Sanitation and General Staff Surgeon, thus presiding over all medical, surgical and sanitary administration. Under Goercke, the Collegium Medico-Chirurgicum became, in 1795, the Medico-Chirurgical Pepinière, otherwise known as the Friedrich Wilhelms Institut, and after 1895, the Kaiser-Wilhelms Akademie. In 1798 a similar Collegium Medico-Chirurgicum had been established for the Saxon Army at Dresden, and in 1785 the Josephinum, or Medico-Chirurgical Academy of the Austrian Army, was established at Vienna. The arduous labors of the Prussian surgeons general in relief of the wounded in the different battles are given in detail by Koehler.<sup>13</sup> Holtzendorff was instrumental in the foundation and extension of the Army medical college. Cothenius organized the field medical service for the Seven Years War, including the hospitals and the medicine chests. Schmucker, who was badly wounded

<sup>12</sup> Koehler: *op. cit.*, 129-218. Bilguer managed the care and treatment of the wounded at Rossbach, Leuthen, Kunersdorf and Torgau. Of the battle of Torgau, he reports that out of 6,618 severely wounded, he lost only 653, while 5,557 recovered and 408 were invalided.

at Soor (1745) and Prague (1761), acquired an extraordinary experience in military surgery in all the battles of the Silesian and Seven Years Wars, of which he has left a record in his valuable collections of surgical cases (1774-82). These include a successful mastoid operation by staff-surgeon Jasser (1776). Bilguer achieved a European reputation through his dissertation of 1761 against reckless and ill-considered amputation, the bane of French surgery, then dominant. He was supported in his contention by the most eminent authorities of his time, and thus became the father of the conservative orthopedic surgery of Syme, Fergusson and Brodie. Theden wrote several books on military surgery, invented and manufactured elastic catheters and canulas, was a pioneer in hydrotherapy, invented a method of ventilation and introduced compressive bandaging. Goercke reorganized the Prussian Army medical department, and is essentially a figure of the Napoleonic period in energy and enterprise.

The likenesses of all these officers in gala uniform or court dress have been preserved, either in the oil-portraits by Pesne and other court-painters of the period, or in the etchings and engravings of Chodowiecki and Moehsen. Holtzendorff and Cothenius are typical 18th century men, with bold eyes and prominent features, like Händel or Hogarth. Eller, Theden and Goercke have something of the finesse which we associate with William Hunter or Benjamin Rush. Bilguer looks frosty and disagreeable and was, in fact, unpopular and ignored, while Theden's jubilee lasted five days. With the exception of Bouness, who may have had some Gallic infusion, all have the preternatural gravity of the Northern races.

### *Battle-losses in Frederick's Campaigns*

As given by Carlyle, and others, the losses in the principal battles of the first and second Silesian wars were as follows:

Mollwitz (April 10, 1741): Prussians, 4,613; Austrians, 4,410 (killed, wounded and missing).

Chotusitz (May 17, 1742): Prussians, 5,000 (1,905 killed); Austrians, 7,000 (1,052 killed).

Hohenfriedberg (June 4, 1745): Prussians, 5,000; Austrians and Saxons, 9,000 and 7,000 taken prisoners (Saxons, 33 officers, 2,419 men killed; 90 officers, 825 men wounded).

Soor (September 30, 1745): Prussians, 1,500 killed, 3,000 wounded out of 18,000; Saxons, 27 killed, 474 wounded.

Kesselsdorf (December 15, 1745): Prussians, 1,604 killed, 3,158 wounded; Saxons, 58 officers, 3,752 men killed and wounded.

In the Seven Years War, the Prussians suffered 8 defeats out of 16 major battles, and lost 190,000 soldiers out of 218,000 and 33,000 of the native population. Their allies, the English, lost 100,000, the Austrians, 110,000, the Russians 120,000, the French 200,000, the Swedes 25,000 and the armies of the old Empire 20,000. The losses in the principal battles were:

Lobositz (October 1, 1756): Prussians, 3,308; Austrians, 2,984.

Prague (May 6, 1757): Prussians, 11,740 killed and wounded, 4,560 prisoners (10.80 per cent total strength); Austrians, 10,000 (14.8 per cent) and 4,275 prisoners.

Kolin (June 18, 1757): Prussians, 6,710 killed and wounded (including 326 officers) and 5,380 prisoners out of 34,000; Austrians, 8,000 (including 1,500 prisoners) out of 53,500.

Grossjägerndorf (August 30, 1757): Prussians, 3,000; Russians, 9,000.

Rosbach (November 5, 1757): Prussians, 165 killed, 376 wounded; Austrians and French (French, 3,650 killed and wounded, 6,220 prisoners).



Leuthen (December 5, 1757): Prussians, 1,144 killed, 5,118 wounded, 85 prisoners out of 30,000; Austrians, 3,000 killed, 7,000 wounded, 12,000 prisoners out of 80,000.

Zorndorf (August 25, 1758): Prussians, 11,385 (3,680 killed) out of 36,000; Russians, 21,529 (6,406 killed, 11,867 wounded) out of 42,000.

Hochkirch (October 14, 1758): Prussians, 9,450 (1,190 killed and missing, 5,381 wounded); Austrians, 8,614 killed, wounded and missing.

Kunersdorf (October 10, 1759): Prussians, 20,720 (48.2 per cent) out of 43,000; Austrians and Russians, 15,700 out of 90,000 (Russians, 2,614 killed, 10,863 wounded).

Liegnitz (August 15, 1760): Austrians, 10,000; Prussians, 1,800.

Torgau (November 3, 1760): Prussians, 13,120 (30 per cent) out of 44,000; Austrians, 11,260 (17.3 per cent) out of 65,000.

### *War of the Austrian Succession*

(1740-48)

The breach made by Frederick the Great in the fabric of the Holy Roman Empire soon set the whole world by the ears. Nearly all the great powers began to cavil at the doctrine of Pragmatic Succession, i.e., the right of Maria Theresa to the imperial throne. In the War of the Austrian Succession (1740-48), which ostensibly challenged this doctrine but actually aimed at the destruction of the old Austrian Empire, there was fighting all over the globe. For this cause, as Macaulay said, the wild Highlanders fell at Culloden, the devoted column at Fontenoy was destroyed, "black men fought on the coast of Coromandel and red men scalped each other by the Great Lakes of North America." The peace of Aix la Chapelle (1748) left Silesia in the hands of Frederick.

The first five years of the War of the Austrian Succession were occupied mainly with Frederick's first and second Silesian Campaigns. During this war, England sided with Maria Theresa, as it was to side with Frederick in the Seven Years War. In the interval between the two Silesian wars, an English army under George II entered Germany and defeated the French at the battle of Dettingen on June 27, 1743. Frederick abandoned the French, who, although driven out of Austria, defeated the Austrians, English, Dutch and Hanoverians at Fontenoy on May 11, 1745. A remarkable feature of this war was guerilla raiding and bushwhacking by hordes of murderous Croats, Hungarian Pandours (Tolpatches) and huzzars. These "Pandourades" spread lawlessness and rapine through whole kingdoms, and were bitterly resented by the people.

At the battle of Dettingen there was present a keen-sighted Scotch officer who, through the Earl of Stair, brought about an agreement with the Duc de Noailles that both the French and English military hospitals were to be regarded as neutral and immune from attack during the

engagement. This was Sir John Pringle (1707-82), who had been made Surgeon General of the British Army one year before (1742) and served in that capacity until 1758. Pringle's account of this temporary Red Cross agreement may be given in his own words:

"Till then it had been unusual for the security of the sick (when the enemy was near) to remove them a great way from the camp; whereby many were actually lost before they came under the care of the physicians. But the Earl of Stair, my illustrious patron, being sensible of this evil, when the army was encamped at Aschaffenburg, proposed to the Duke de Noailles (of whose humanity he was well assured) that the hospitals on both sides should be considered as sanctuaries for the sick, and mutually protected. This was readily agreed to by the French General, who took the first opportunity to show a proper regard to his engagement. For when, after the battle of Dettingen, our hospital was at Feckenheim, a village upon the Maine, at a distance from the camp, the Duke de Noailles, having occasion to send a detachment to another village, upon the opposite bank, and apprehending that this might alarm the sick, he sent to acquaint them, that, as he knew the British hospital was there, he had given express orders to his troops not to disturb them. This agreement was strictly observed on both sides during the campaign, and though it has been since neglected, yet it is still to be hoped that on future occasions the contending parties will make it a precedent."<sup>14</sup>

In 1752 Pringle published his *Observations on Diseases of the Army*, the most important text-book on military medicine of the time, in which are laid down the true principles of military sanitation and the ventilation of hospital wards. Pringle was one of the pioneers of the antiseptic idea, showed that jail fever and hospital fever are one and the same, did much for the better ventilation of ships, barracks, jails and mines, correlated the different forms of dysentery and gave the name influenza to that dread disease. This work, the source-book of all subsequent writers, was followed by Van Swieten's book on *Camp Diseases* (1758) and Richard Brocklesby's *Observations on Military Hospitals* (1764). In the Navy, James Lind's *Essay on the Hygiene of the Sailors* (1757) became a classic, especially in relation to the prevention of scurvy.

The siege of Metz (1552) and the battle of Dettingen (1743) were by no means the only instances of a temporary Red Cross agreement. No less than five, between 1743 and 1864, were placarded at the Berlin exposition of military medicine in 1914.

During the early part of the century, constant attempts were made to arrange some disposition of the wounded which would not interfere with military operations. At the battle of Fontenoy (1745), the wounded were treated on the front line by regimental surgeons, then collected at ambulance stations, where major operations were performed, and finally evacuated to hospitals in cities farther back, an almost perfect system.

<sup>14</sup> Pringle, *Observations on the Diseases of the Army*, London, 1752, preface, pp. viii-ix.

Heizmann's account of this important episode<sup>15</sup> may be quoted in full:

"The contending forces, allied English, Dutch, Hanoverians and Austrians, 55,000, and the French, 60,000, were organized very much alike: foot battalions of five companies containing 100 to 140 men each, two to four battalions making a regiment numbering 1,000 to 2,700 men, the English battalions being slightly largest; cavalry, in squadrons of about 100 men each. As at this time each infantry regiment had a surgeon and mate or assistant, it is estimated that the Allies had about forty regimental medical officers, the French as many; the cavalry of both armies had none. There was on both sides a small number of physicians, one usually to a garrison of about 10,000 men, and army surgeons. The infantry were armed with flintlock muskets and bayonets, the sword having been abandoned about this time, and they worked the fieldpieces of artillery, the largest mentioned being a battery of six 16-pounders on the bank of the River Scheldt opposite the field, to cover the retreat of the French King. All arms were engaged at one time or another, the artillery opening the battle, and at the critical moment, supported by cavalry, saving the day for the French, an occurrence said to have been the first combination of the two arms in history.

With the village of Fontenoy toward the right of the French centre, the length of the line that bore the brunt of the battle was about 1,200 yards, and the width, of what was practically a closed field, was 2,000 yards. The point where the English and Hanoverians massed their attack was on the left of the village, including it eventually, and it was here that the terrible slaughter of the French infantry nearly won a victory for the allies. Surgeons were posted on the first line, as is proved by the fact that while the English were advancing on the regiment stationed nearest Fontenoy, the French lieutenant-general Luttaux was wounded, and his aide implored him to have his wound first dressed before going to report to the king. The regiments of Hainaut and Dillon were, in the beginning, on the French left, and which, moving toward the centre to stay the English by an attack in the flank, lost heavily. It is stated by Boucher that on the field itself amputations were performed on wounded of these regiments, it is inferred, at the ambulance hospitals, which were, at the farthest, about 2,000 yards from the front line. After the battle these ambulances were evacuated and the wounded carried on caissons and carts to cities in the rear, principally to Lille, 16 miles, and Douai, 20 miles distant, where an immense number of surgical operations were performed at hospitals established for the purpose, the civil hospitals, churches and private houses being used. A battle begun with an exchange of fencing master's compliments ought to have terminated by an exhibition of practical philanthropy, and Voltaire says that in these hospitals no comfort was wanting for the wounded French or their prisoners. The zeal of civilians and soldiers was such that the surgeons were obliged to interfere, and the hospitals were so well managed that officers preferred to be treated there. The Allies carried 600 wounded twenty miles, to Ath, where a hospital was established in the casernes; they left 1,200 in the hands of the French, who had of their own 4,000. Here then, at Fontenoy, May 11, 1745, wounded soldiers were treated on the first line by regimental surgeons; they were collected at ambulance stations, where capital operations were performed, then transferred to hospitals prepared for them in near cities, and, when these became overcrowded, to cities farther away. A few months after this battle, Maillebois conducted an army into Italy, his chief physician being Baron, who was subsequently dean of the Faculty of Paris, and in nearly every daily order for marching and camping is designated a place for the hospital *ambulant*, usually on the march in rear of the artillery with the treasure and provisions. The day before the battle of Bassignano, September 27, 1745, three ambulance hospitals were

<sup>15</sup> Heizmann: *Ann. Med. History*, N. Y., 1917-18, I, 299-300.

organized, one for each column, and ordered to take station at villages, each about 1,200 yards in rear of the line of battle on the river Tanaro, where an engagement was expected. Two of these hospitals actually united opposite the centre of the line, which covered ground about 6,000 yards long. And in the "Art of War," by the Marechal de Puységur, published in 1749, a map for illustration shows the ambulance about 2,500 yards in rear of the first line. Excepting an untried project of Ravaton, very little improvement, on Randby's outline and Bagieu's account, took place subsequently until Larry and Percy made their names immortal, not only for the invention of details to rapidly relieve and remove wounded soldiers during battle on a scale never equalled, but for their inestimable contributions to operative military surgery."

Among the surgeons' mates on the naval expedition of Admiral Vernon to Carthage (1741) was the Scotch novelist Tobias Smollett (1721-77), who gives the following account of the status of the sick and wounded who survived the storming of Fort Lazar<sup>16</sup>:

"As for the sick and wounded, they were next day sent on board the transports and vessels called hospital-ships; where they languished in want of every necessary comfort and accommodation. They were destitute of surgeons, nurses, cooks and proper provision; they were pent-up between decks in small vessels where they had not room to sit upright; they wallowed in filth; myriads of maggots were hatched in the putrefaction of their sores, which had no other dressing than that of being washed by themselves with their own allowance of brandy; and nothing was heard but groans, lamentations and the language of despair, invoking death to deliver them from their miseries. What served to encourage this despondence, was the prospect of those poor wretches who had strength and opportunity to look around them; for there they beheld the naked bodies of their fellow-soldiers and comrades floating up and down the harbour, affording prey to the carrion-crows and sharks, which tore them in pieces without interruption, and contributing by their stench to the mortality that prevailed.

This picture cannot fail to be shocking to the humane reader, especially when he is informed, that while those miserable objects cried in vain for assistance, and actually perished for want of proper attendance, every ship of war in the fleet could have spared a couple of surgeons for their relief; and many young gentlemen of that profession solicited their captains in vain for leave to go and administer help to the sick and wounded. The necessities of the poor people were well known; the remedy was easy and apparent; but the discord between the chiefs was inflamed to such a degree of diabolical rancour that the one chose rather to see his men perish than ask help of the other, who disdained to offer his assistance unasked, though it might have saved the lives of his fellow-subjects."

#### *War of the Bavarian Succession (1778-79)*

In 1777, Maximilian Joseph, Elector of Bavaria, died without issue. The disputes about the succession following this event, and the fact that Emperor Joseph II of Austria assumed possession of the Elector's lands, occasioned a brief war, into which the aged Frederick the Great was reluctantly drawn. In July, 1778, he crossed the Bohemian border at the head of an army of 100,000 men, but there was no fighting of consequence and the difficulties were resolved by the treaty of Teschen

<sup>16</sup> Smollett, *Miscellaneous Works*, Edinburgh, 1806, IV, 445-469. Cited by Carlyle.

(May 13, 1779). The principal interest of this brief campaign is that almost for the first time Frederick's forces suffered materially from disease, with an enormous mortality from dysentery and typhus fever. Of his first Silesian army, he lost by disease 9,300 men; of the second, numbering 69,113, 5,200 died in six months, while the Saxon army of 22,000 lost only 48 in the same period. Frederick brooded long over these losses and on July 10, 1786, he instructed staff surgeon J. G. Fritze to make a thorough inspection and critique of Prussian military hospitals, resulting in Theden's Regulation of September 16, 1787, which remained in force up to the Instructions of October 2 3, 1809.

### *Military Surgery in the 18th Century*

"At the beginning of the 18th century," says Billings, "the only city in which there were any special opportunities for the study of surgery was Paris. There was no place for the barbers or the barber-surgeons in the Universities of Europe, and they had no institutions of their own in which any teaching worthy of the name could be obtained. Many of them had learned something in the camp or on the battlefield, which was the great practice school for surgeons, as it had been for three centuries."<sup>17</sup> The leading French surgeon of the time was Jean Louis Petit (1654-1730), inventor of the screw tourniquet and the first to open the mastoid (1736), and to whom Frederick the Great applied in 1744 for a selection of French surgeons to serve as officers in the Prussian army. Desault, the teacher of Bichat, Dionis, Brasdor, Anel, Litttré, La Peyronie, David, Le Cat, Chopart and David are among the prominent French names of the period. In England, Cheselden, Pott and John Hunter were the leading figures; in Germany, Heister, Bilguer, Gabriel Senff, C. C. von Siebold and A. G. Richter.

In the first half of the 18th century, belief in the weapon salve and the sympathetic powder disappeared, and wound-treatment became simpler. Hemorrhage was treated with styptics, of which Heister recommended lycoperdon powder and "the sharpest brandy," and Bilguer the sponge, alcohol and turpentine. Cauterization of blood-vessels in amputation was still practiced by Purnann in 1710, while ligation of arteries (isolated by the forceps), although opposed by J. L. Petit, is described and recommended in Heister's Surgery (1718). In gangrene, Bilguer, who was chary of amputation, ligated the principal vessel in the healthy part and then cut down. In ordinary cases, he is said to have got unusually good results by free incisions. Wounds were still stuffed with charpie moistened with wine or brandy, and if suppuration threatened, such antiseptics as corrosive sublimate in chalk solution (*aqua phagedaenica*), balsam of Peru, tincture of myrrh, camphor or hot turpentine were sometimes employed (Koehler). While it is to the credit of Bilguer, Schmucker, Theden, and Mursinna that they substituted dry bandages or bandages moistened with plain water for the dubious and complex salves and plasters,

<sup>17</sup> J. S. Billings: *History of Surgery*, New York, 1895, 69

yet, as Billings says, the other surgeons of the time "kept on prescribing and using their oils, ointments, plasters, vulnerary drinks, etc.," because these remedies, devised and prepared by themselves, increased their fees. "Charges were made for the remedies and not for the visits." Almost every prominent surgeon had a special arquebusade or vulnerary water, the secret of which was jealously guarded. Although Purmann and Voitius, along with the English and French surgeons, declaimed against the unethical foible of secret remedies, they were very popular in Germany. Schmucker had a private eye-water and Theden a secret arquebusade. The probing of wounds, so vigorously opposed by Felix Würtz, continued to be practiced until Stromeyer did away with the probe and Semmelweis, Pirogoff and Lister exposed the evil consequences of dirty fingers. Trephining as a routine procedure in head injuries was upheld by Le Dran, Mareschal, Pott, Bilguer and Mursinna, and opposed by Desault, John Bell and to some extent by Heister. Purmann, who trephined 40 times in 12 years' experience, followed the old Hippocratic rule of operating for pressure symptoms, i. e., vomiting, aural hemorrhage, loss of consciousness and convulsions resulting from depressed or splintered fractures, with subcranial hemorrhage; in headache, epilepsy, vertigo, etc., only when of long duration. Heister limited the operation to open head injuries and extradural hemorrhage. Schmucker and Theden treated most cases by cold compresses. At the siege of Schweidnitz (1762), Schmucker had a special hospital for head injuries, in which he classified and studied his cases. As stated, Bilguer was the great opponent of reckless amputation (1762), or what Frederick the Great styled "lopping off arms and legs by the dozen (1781)." The monograph, although in direct opposition to the teaching of Le Dran, was translated into all languages. Bilguer's six indications were: gangrene, bad mauling of the limb with threatened fatality, marked contusion with multiple fracture, injuries of the great vessels, incurable caries of bone and cancer. Charles White first excised the head of the humerus in 1768, which was repeated by Bent in 1771, while the same operation was performed nine times by Percy, of Napoleon's army, during 1792-5. In 1793, Goercke resected the elbow joint for gunshot wound. Exarticulation or "amputation in the joint" was favored by Schmucker for the shoulder and hip, and rejected in the case of elbow and knee, since the tissues in these parts were not adequate for a suitable flap. Among the bolder operations of the 18th century were the first laparotomy for localized appendicitis by Mestivier (1759), John Warren's amputation of the shoulder-joint (1781), Abernethy's ligations of the external iliac (1796) and common carotid (1796), and the laparotomies of John Bard (1759) and William Baynham (1791-9).

The most original scientific surgeon of the 18th century was John Hunter (1728-93), of Long Calderwood, Scotland, who gained his remarkable knowledge of gunshot wounds while on duty as senior staff surgeon on the Belle Isle expedition (1761) and in Portugal (1763), became deputy surgeon-general of the British Army in 1786 and was appointed surgeon general and inspector of regimental infirmaries in 1791. Hunter was the founder of experimental surgery and surgical pathology and a remarkable pioneer in comparative physiology and experimental morphology.

He first described shock, phlebitis, intussusception, hard chancre and chancreoid, introduced the principle of ligating high up in the healthy tissues for aneurism (1786), made many discoveries in human and comparative anatomy and through his great treatises in dentistry (1771), venereal disease (1786), inflammation and gunshot wounds (1794), created a new epoch in surgery. Like other officers of scientific bent, he was but an indif-

ferent military administrator and was described by Robert Jackson as "a man of an original mind and considerable discernment, but too little acquainted with military operations in the field to foresee everything that was likely to occur in military service, and provide on all occasions, from his own source of knowledge, the best means of remedy. He considered the cure of diseases, whether by manual operation or the use of internal remedies, as the proper business of a medical man destined for the service of the army."

### *Military Hygiene in the 18th Century*

The personal hygiene of the soldier, his clothing, food, shelter, hospitalization and general sanitary welfare were favorite themes of study with the military authorities of the 18th century and came to be summarized in compact treatises, such as those of Pringle (1752), Brocklesby (1764), Monro (1764), Colombier (1772) and others.

The *Règles* of the Marechal de Saxe (1738) enlarges particularly upon clothing, foot-gear, rations, bathing, amusements and general creature comforts. Uniforms, supplied as a source of profit by officers in France until 1729 and in England until 1838, were at first theatrical, unsanitary and poorly adapted to heat or cold. Saxe discarded white gaiters, as suitable only for parades, linen stockings, as leading to foot trouble, and garters as constricting the circulation, substituting low-heeled leather shoes, worn upon the bare feet, with puttee-like arrangements, surmounted by leathern breeches buttoned above the knee; the coat was a loose-fitting sack, extending to the thighs or knees, the head-dress being a casque surmounted by a panache of plumes. The Comte de Sainte Germain, Minister of War, proposed a cloth coat, breeches of tricot, a vest of white cloth and a linen girdle." Some 20 odd specimens of uniforms of the different arms, including *just-au-corps* and frock-coats, riding breeches, long riding boots, cravats, cuirasses and three-cornered hats, were exhibited at Dresden in 1911. Greasing or oiling the hands and feet against cold were recommended by Saxe, while Meyserer recommended gloves of fur or thick linen, high leather shoes (*brodequins*) and linen quilts. In the matter of rations, Frederick the Great said that the stomach is "the basis and foundation of all military operations. In 1751, the French ration was 28 ounces of bread and half a pound of meat daily, except on Fridays. Saxe insisted that the meat should be served partly as a soup at mid-day and as a roast in the evening. Bread was frequently adulterated at this time, and such bread was regarded as deleterious to wound healing. Unripe or spoiled fruits and unboiled water were common sources of illness. The Roman custom of adding a few drops of vinegar to potable water was followed by Frederick and Napoleon. Wine, beer and cider were permitted in moderation, but French government placards against brandy canteens existed even in 1683. Wines plastered with litharge or other lead salts were true poisons. Rations of tobacco were ordered by Louis XIV (1672-1683). Singing and jollity on the march, theatrical performances in camp, etc., were also regarded by Saxe as excellent for morale and the cheerful disposition necessary for good soldiering. Sites of camps and of latrines were chosen with care, and directors of hospitals were required to wash and whitewash the walls to destroy vermin. French orders of 1701, 1728 and 1752 required daily cleaning of the wards before wound dressing and after the evening meal. The courts, staircases and corridors were swept once daily and the kitchens and bakeries of the hospital were also to be kept scrupulously clean. In spite of all this, hospitals continued to be dirty, overcrowded and, in consequence, hotbeds of infection. In 1777-89 the English philanthropist, John Howard (1726-90), published his epoch-making investigations of prisons and lazarettos, which had much to do with the suppression of typhus fever, by demonstrating its transmission through overcrowding

and filth. In 1788, Jacobus René Tenon published a memoir of equal moment on the hospitals of Paris, containing his celebrated description of the Hôtel Dieu. This, the most important landmark in the history of hospital administration, was instrumental in bringing about many important and much needed reforms in Paris, Vienna, Moscow and other cities. At this time, even hospital service by physicians was sometimes regarded as a "sentence of death" (Baas). Stephen Hales (1743) and Theden invented methods of artificial ventilation, while Pringle and Brocklesby did much to prove that plenty of fresh air in spacious hospital wards and wide dispersion of the patients in such wards or in separate tents were potent factors in lessening the mortality from communicable diseases. Thus, there was but little mortality in the temporary open sheds used for the sick evacuated to the Isle of Wight in 1758, or the small hospital huts introduced by Brocklesby in 1760 and again employed in the camp at Winchester in 1761, although the patients were some times exposed to cold and rain. In the Flanders campaigns of 1743-48, it was also observed by Pringle that sickness increased in camps and hospitals located on damp low-lying sites, while detachments quartered in high and dry localities furnished hardly any quota to hospital. In the Low Countries, pleurisy and pneumonia, rheumatic affections, intermittent and inflammatory fevers, diarrhoeas and dysenteries were responsible, in the order named, for the highest disease incidence and mortality. In 1762, the following excellent "Regulations for Hospital Management" were proposed by Robert Gordon, a military surgeon attached to Winchester Camp, and approved by Brocklesby:<sup>14</sup>

1. A sergeant will be appointed to the hospital to preserve good order and regularity among the sick. He will provide all necessaries ordered by the surgeon, keep an account of the same open to the inspection of every officer, to see that nothing is brought out of the hospital except by his order, especially strong liquor. Every night at tattoo he is to call a roll of the sick, lock the door, and be answerable that none stir out, but go to bed immediately.

2. The pay-sergeant of each company to pay into the hands of the hospital-sergeant every day the subsistence of his men, with all proper necessaries ordered by the surgeon. This account to be settled by the hospital-sergeant with the surgeon every week, and by the surgeon with the paymaster every month.

3. Two orderly men to be appointed by the surgeon, to assist in taking care of the sick at hospital, who are to take their orders from the surgeon or the sergeant of the hospital, which they are punctually to obey.

4. No man, on any pretence of illness, to be excused parade or any other duty, unless reported to the surgeon, and when reported the sergeant or corporal of his company is immediately to send him to hospital when taken ill; if unable to walk, he is to be carried.

5. After this order, every man found sick in his quarters, unless by leave of the surgeon, will be severely punished; any sergeant or corporal found remiss in sending men to hospital immediately, when taken ill, will be assigned or brought to court-martial, and degraded, for neglect.

6. Every man ordered to hospital to take with him his knapsack and necessaries, and deliver them to the hospital-sergeant, who is to take them in charge, and deliver them to the man when he recovers.

7. If any man in hospital is guilty of irregularity, or refuses to comply with orders of the hospital-physician or sergeant, or makes any disturbance, or shall misbehave himself to the sergeant or his superior officer of the hospital, he will be severely punished.

8. A sentry is to be posted at the hospital door during the morning, at the same time as at head-quarters, where instructions as to his duty will be put up at the door in writing,

<sup>14</sup> R. Brocklesby: *Economical and Medical Observations*, London, 1864, 81-85. Cited by Gore, *op. cit.*, 94-96.



and read to the relieving sentry by the corporal of the guard at every mounting. Signed by the Colonel to enforce the necessary obedience.

The orders for the sentry were that no patient was to pass beyond his own guard without a ticket from the surgeon; that no strong liquors were to be brought out of hospital. He was to take care of the fire, and see that no mischief was done to the house, that no dirt was thrown near his post or anyone suffered to enter the hospital without cleaning or scraping his shoes, and he was to prevent too many people of the camp or heath from paying frequent or long visits to the hospital.

Brocklesby, whose treatise of 1764, is the best book on sanitary administration in the century, also recommended:

1. To avoid all manner of nastiness in every encampment.
2. To pay frequent attention to the shifting and covering in of all the privies in the rear as soon as, or before ever they begin to be offensive to those who are a few yards distant.
3. Always to keep as few possible sick in one room or under the same roof.
4. To air and turn the straw on which the men lie in their tents twice or thrice a week in summer encampments.
5. All buildings selected for military purposes to be as lofty and spacious as possible.
6. The physician's power in a military or camp infirmary to be as peremptory as that of the commanding officer over all his corps out of that place.

The physician was advised to manifest, in all his management of the hospital, an inviolable attachment to method in all things; to fixed hours in dressing the wounded, visiting the sick, having their medicines prepared and proper medicated drinks, without which fixed methods, whenever there were many sick, they would often suffer very much.

Prostitution in the armies of continental Europe<sup>19</sup> ultimately resolved itself into toleration of soldiers' "wives" on the theory that fewer men deserted if domesticated in regiments by women, and that such women, as constituting a species of sexual canteen, were less liable to transmit venereal disease. Prussian orders of June 1, 1713, and February 28, 1714, stipulate that soldiers' wives may occupy quarters but have no claims to light, fuel, food, beds, etc., and the same note is sounded in Austrian Field Regulations of March 12, 1759. An edict of Friedrich Wilhelm I of Prussia limits the number of married soldiers to one-third of the command. A Prussian circular of August 23, 1733, permits 10 per cent of a company to be married. In Frederick's march on Glogau (1740), the first casualty was the accidental drowning of a soldier's wife "of the Bredow regiment" (Carlyle, XII, ch. II). In the Saxon army of 1790, there were 20,000 illegitimate children to 30,000 men. Carnot, in 1793, drove 3,000 women away from the barracks at Douai because the diseases transmitted by them "killed ten times as many men as enemy fire." Archenholz, in his *History of the Seven Years War*, tells of the large number of loose women, even in officers' quarters, and of the adoption of the French custom of passing such women, stripped to the waist, through two rows of soldiers, who belabored them

<sup>19</sup>W. Hüberling: *Ztschr. f. Bekämpf. d. Geschlechtsskr.*, Leipzig, 1914, XV, 326-332.

with switches. This was forbidden by the French orders of 1750, in which camp followers were to be cured of any diseases in hospital before commitment to the work-house. In spite of the many orders, and of such expedients as "tented brothels" (*Hurenzelte*), the problem of limiting prostitution in large commands was as difficult as among the civilian population.<sup>19</sup> Venereal infection was very widespread at this time. When any of the gentry went into seclusion it was assumed that they were undergoing "the tub-fast and the diet." The increase of the neurotic in modern times has been attributed to the fact that the ancestors of the civilized were, like Metchnikoff's ape, "syphilized." The main thesis of Dean Swift's satirical "Argument" against the abolishing of Christianity (1708) was that the clergy were best adapted to propagate healthy specimens of the race, as being less exposed to debauchery and disease.

#### *The American Revolution*<sup>20</sup>

The history of our Army Medical Department begins auspiciously in the Colony of Massachusetts Bay, where, on May 8, 1775, the Provincial Congress ordered that a committee of physicians, appointed by the Congress, examine, as to professional qualifications, all persons recommended for appointment as surgeons to the several regiments by their commanding officers. Prior to this date, medical aid in such engagements as Concord fight or Lexington had been voluntarily rendered by private physicians, who later sent in bills for services rendered. These physicians had no military status or authority whatever. As described by Thacher, in his *Military Journal of 1775*, the examinations set in anatomy, physiology, surgery and medicine, were so rigorous that a perspiring candidate, when asked how he would promote sweating in a rheumatic patient, replied: "I would have him examined by a medical committee."

After the battle of Breed's Hill, hospitals were established at Cambridge, Watertown, Roxbury and elsewhere, with regulations drafted by the Congress, and appropriate warrants were issued to the hospital surgeons and mates. At this time, the inchoate medical establishment of the Army was termed "The Hospital." On July 19, 1775, the Colonial Congress in Philadelphia appointed a committee to consider ways and means of establishing the Hospital, a project strongly recommended by Gen. Washington on July 21. On July 27, Congress reported a bill for its organization, which was adopted, with Dr. Benjamin Church as Director General and Chief Physician, at four dollars *per diem*. Three months later (October 3, 1775), Church was tried by a council of war, for treasonable correspondence with the enemy, and imprisoned. On October 17, Dr. John Morgan was appointed to succeed him. Morgan, who had been instrumental in organizing

<sup>19</sup> H. E. Brown: *The Medical Department of the United States Army from 1775 to 1873*. Washington, 1873, 1-86. W. O. Owen: *The Medical Department of the United States Army during the Period of the Revolution*, New York, 1920.

the Medical Department of the University of Pennsylvania (1765), rendered most valuable services up to his unjust dismissal from the Army on January 9, 1777. On April 14, Dr. William Shippen was appointed to succeed him. Meanwhile Morgan had published his spirited *Vindication* (1777) and received a tardy, but handsome exoneration at the hands of Congress on June 12, 1779. Morgan's dismissal was due in part to the increasing sickness among the troops, the difficulty in supplying them with medical supplies, but principally to the fact that Drs. Stringer, Shippen and others had been appointed to regional directorships, with the usual division and decentralization of authority and the jealousies naturally resulting therefrom. At the time of Shippen's appointment, the Prussian and English plan of medical administration was in full swing, with Physicians, Surgeons and Deputy Directors General and a fourth staff officer dubbed "Physician and Surgeon General of the Army" in each of the Middle, Eastern and Northern Departments. These four "generals" were of vague status but apparently coeval with the Director General of "The Hospital." All this led to further contretemps, such as the resignation of Benjamin Rush in the trying Valley Forge period (1778) and the court martial and acquittal of Shippen (1870). There resulted the Congressional bill of September 30, 1780, with the reelection of Shippen as Director General and the appointment of John Cochran as "Chief Physician and Surgeon." Finally, at the end of the War, Congressional Acts of July 25, 1782, and January 1, 1783, assigned a Director and Deputy Director to the Hospital Department. During the war, Washington manifested the keenest interest in the welfare of the medical establishment, particularly in his instructions to Morgan for the removal of the Hospital to New York (April 3, 1776), his letters to John Hancock on the dubious and jealous character of the regimental surgeons and their intrigues against the Hospital (1776-77) and his letter of approval of Shippen's and Cochran's plan for reorganization (February 14, 1777). The animus of Congress had been against centralization, and although the reorganization acts of July 17, 1776, April 7, 1777, February 6, 1778, and July 21, 1780, were progressive in spirit, it took a long time to reach the final stage. Our first hospital regulations were drafted by Morgan, after conference with Washington and the regimental surgeons, and published in July, 1776. In March, 1778, Baron von Steuben, a former aide of Frederick the Great, arrived in the country to offer his services to the government. In May, 1778, at the instance of Washington, he was appointed Inspector General of the Army. Steuben's work in improving the organization, drill and discipline of the army, quietly and unobtrusively done, was of the highest value. In 1780, he drafted and published our first Army Regulations, of which the following relates to the medical establishment:

*Of the Treatment of the Sick*

There is nothing which gains an officer the love of his soldiers more than his care of them under the distress of sickness; it is then he has the power of exerting his humanity and making their situation as agreeable as possible.

Two or three tents should be set apart in every regiment for the reception of such sick as cannot be sent to the general hospital, or whose cases may not require it. And every company shall be constantly furnished with two sacks, to be filled occasionally with straw, and serve as beds for the sick. These sacks to be provided in the same manner as clothing for the troops, and finally issued by the regimental clothier to the captain of each company, who shall be answerable for the same.

When a soldier dies, or is dismissed from the hospital, the straw he lay on is to be burnt, and the bedding well washed and aired, before another is permitted to use it.

The sergeants and corporals shall every morning at roll-call give a return of the Sick of their respective squads to the first sergeant, who must make out one for the company, and lose no time in delivering it to the surgeon, who will immediately visit them, and

order such as he thinks proper to the regimental hospital; such whose cases require their being sent to the general hospital, he is to report immediately to the surgeon general, or principal surgeon attending the army.

Once every week (and oftener when required) the surgeon will deliver the commanding officer of the regiment a return of the sick of the regiment, with their disorders, distinguishing those in the regimental hospital from those out of it.

When a soldier is sent to the hospital, the non-commissioned officer of his squad shall deliver up his arms and accoutrements to the commanding officer of the company, that they may be deposited in the regimental arm-chest.

When a soldier has been sick, he must not be put on duty till he has recovered sufficient strength, of which the surgeon should be judge.

The surgeons are to remain with their regiment as well on a march as in camp, that in case of sudden accidents they may be at hand to apply the proper remedies.

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In 1778, the earliest American pharmacopœia was prepared for the use of the Continental Army by Dr. William Brown, Physician General of the Middle Department, and published anonymously (second edition, 1781). In 1776, Dr. John Jones published a treatise on wounds and fractures, which was not only the first American book on surgery, but also, through the appendix on camp and military hospitals, our first book on military medicine. In 1777, Benjamin Rush published his pamphlet on the hygiene of troops. Shippen drafted a plan for flying ambulances in 1777, and James Tilton introduced log hut hospitals in 1780. During the war, the troops suffered much from sickness and cold, particularly in 1775, when a specimen sick report of September 23 records 2,817 out of 19,365 (145.4 per 1,000), and in the severe winters of 1777-8 (Valley Forge) and 1779-80. The British troops suffered throughout the war from sickness and lack of supplies. Their regimental hospitals are described by Gore as "simple collections of sick men huddled together," without organization, regulations, clothing or rudimentary comforts.

Variolation or preventive inoculation of human virus against smallpox, was introduced in England by Lady Mary Wortley Montagu (1718-21) and in America by Zabdiel Boylston (1721). Through the improvements in technic introduced by Kirkpatrick and Gatti (attenuation of the virus and dietetic preparation of the patient) this mode of preventive inoculation attained an almost scientific status, and the custom of "buying the smallpox" (purchase of scabs in open market) became common. The difficulty was that the inoculated person became a true smallpox carrier, while fatal mixed infections were numerous. In the Continental Army, inoculation became common among the soldiers during the smallpox epidemic following the retreat from Quebec (1776), although forbidden in General Orders, and use of unattenuated virus produced many fatal infections. The practice continued until swept away by Jennerian vaccination in 1796-8.

After Yorktown (October 19, 1781) Congress rapidly demobilized the Army in 1782-3 and the Hospital Department was practically disbanded. After June 2, 1784, the army consisted of 25 privates at Fort Pitt and 55 at West Point, "with appropriate officers." In 1788, there were 595 militiamen in the United States and 700, with 5 medical officers, in 1789. By the act of March 5, 1792, the army was reorganized as a "Legion" (5,120 men) with Richard Allison as "Surgeon to the Legion" (1792-6). On May 3, 1798, war being imminent with France, Congress authorized an army of 10,000 men with James Craik as Physician General (1798-1800). These forces were disbanded in May-June, 1800. The army was again increased for the war of 1812, and with the appointment of James Tilton as Physician and Surgeon General on June 11, 1813, the history of our permanent Medical Corps begins.

*(To be continued)*

## COMMENT AND CRITICISM

### CAMP MERRITT BASE HOSPITAL OFFICERS' ASSOCIATION

The Camp Merritt Base Hospital Officers' Association will hold its third annual dinner on Saturday evening, May 13, 1922, at 7 p. m. at the Yale Club, 50 Vanderbilt Avenue, corner of 44th Street, New York, N. Y. A second dinner of the association will be held on Friday evening, May 26, 1922, at 7.30 p. m. at the Planters Hotel, St. Louis, Mo., on the evening of the last day of the annual meeting of the American Medical Association in St. Louis. Dr. David P. Ferris, 1000 Carleton Building, 6th and Olive Streets, St. Louis, Mo., is the chairman of the local committee on arrangements for the St. Louis dinner. Each dinner will be \$5 per plate. Dr. Edward S. Rimer of New York City is the president of the association and Dr. Walter B. Mount of Montclair, N. J., is the secretary.

### BOARD TO ADMINISTER THE MEDICAL FELLOWSHIPS

The National Research Council has appointed a special Board of eminent medical men to administer the National Fellowships in Medicine which the Research Council is able to offer through special gifts to it by the Rockefeller Foundation and General Education Board amounting to \$100,000 a year for five years.

The members of the board are: Victor C. Vaughan, formerly Dean, Medical School, University of Michigan, now Chairman, Division of Medical Sciences, National Research Council, *ex-officio*, chairman; David L. Edsall, Professor of Medicine and Dean of the Medical School, Harvard University; Joseph Erlanger, Professor of Physiology, School of Medicine, Washington University, St. Louis; G. Carl Huber, Professor of Anatomy and Director of Anatomic Laboratories, University of Michigan; E. O. Jordan, Professor of Bacteriology, University of Chicago; Dean Lewis, Professor of Surgery, Rush Medical School, Chicago; W. G. MacCallum, Professor of Pathology and Bacteriology, Johns Hopkins University; Lafayette Mendel, Professor of Physiological Chemistry, Yale University; and W. W. Palmer, Professor of Medicine, Columbia University, School of Medicine.

The fellowships are open only to students who have already obtained the degree of M.D. or Ph.D. or have equivalent qualifications. Fellows will be appointed for one year with the privilege of applying for reappointment. Applications or requests for special information should be made to the Division of Medical Sciences, National Research Council, 1701 Massachusetts Avenue, Washington, D. C.

### THE AIR SERVICE MEDICAL ASSOCIATION OF THE UNITED STATES

The annual meeting of the Air Service Medical Association will be held at St. Louis, in connection with the meeting of the A. M. A. It is expected the meeting will be at 10 a. m., May 24, at Washington University. True particulars concerning time, place and program will be posted at the Regulation Office in the Moolah Temple, on Lindell Boulevard.

### AMERICAN PROCTOLOGIC SOCIETY

The American Proctologic Society will hold its twenty-third annual meeting at St. Louis, Mo., May 22 and 23, 1922, meeting place and headquarters, Hotel Claridge. The profession is cordially invited to attend the public sessions.



## BOOK REVIEWS

SUBMUCOUS RESECTION OF THE NASAL SEPTUM, by William Meddlaugh Dunning, M.D., Surgical Publishing Co. Pp. 97.

This little book is a timely and very satisfactory review of the submucons operation for septal deflection.

The larger textbooks can, perforce, devote comparatively small space to this subject, and often in them the more complex conditions are not made clear.

Dr. Dunning has presented his subject in a lucid and precise manner, and the text is illustrated with numerous line drawings which are highly instructive.

To the beginner in the field of nasal surgery this manual will prove of considerable value, and probably we may all find in it some useful suggestions.

A number of histories of unusual cases are cited and lend interest and value to the work.

A very satisfactory little book.

T. E. OERTEL.

EVOLUTION OF MODERN MEDICINE (The Silliman Lectures), by Sir William Osler, Bart, M.D., F.R.S. New Haven: Yale University Press, 1921.

The most human quality possessable by man is humanity. Several years ago, the only scion in his generation of a very old, very aristocratic and highly cultured Boston family, whose loyalty to his inherited traditions had—to say the least—suffered no diminution from the fact that Harvard University had but recently awarded him the degree of Bachelor of Arts, arrived in Baltimore to undertake the study of medicine at Johns Hopkins University. Approaching the main entrance of the hospital at a timely hour on the first day of the new session, this young man of a sudden became aware of a quick step behind him, felt himself vigorously whacked between the scapulae, and in the same instant heard a cheery greeting, "Hello, first year man!" The conventions of Boston and Cambridge experienced a mild degree of traumatic shock, and it was perhaps with some slight natural asperity that our newly made "A. B." turned to inform himself as to the source and cause of this unwonted familiarity. Fortunately—as he himself always related the incident—the face that grinned at him from behind a hand extended for a friendly clasp was not unknown, and the curt speech that had risen to his ready lips remained unuttered. In later years the man who had so informally welcomed new matriculates to Hopkins used to walk the classic streets of Oxford with hat on the back of his head, hands in trousers pockets, whistling—as like as not—a bit of American ragtime or a march of Sousa, and speaking to all whom he met in the same unconventional manner that had been characteristic of him in this country. For a time Oxford stared and perhaps—who shall say—wondered. But no community could for long resist Sir William Osler's essential "humanity."

A man so vitally interested in all other men as human individuals could do no otherwise than write for his readers and speak to his hearers (no matter what might be the theme of his discourse) after a very direct and personal fashion. And thus it is that no characteristic of "The Evolution of Modern Medicine" is more pronounced than the almost conversational tone which pervades its each and every chapter. Although no page is without its quotation and allusion that serve to show forth the vast store of classical learning which the author had at his tongue's end, or at his fingers' tips, or wherever it may be that so fine a scholar carries all such intellectual treasures, nevertheless any man who sinks into a cushioned chair before an open fire and gives himself up to this book may allow himself

to feel in every sentence—be he physician or layman—that Dr. Osler is sitting at the other side of the hearth and talking to him by word of mouth. There are reasons for this. The book is based upon a series of the Silliman Lectures delivered in person by Sir William at Yale University. Although these lectures were given in 1913, the book itself has but recently appeared from the Yale University Press, the reasons for delay being directly and indirectly dependent upon the European War.

It is in no sense a textbook of the history of medicine that we have here. In truth, it is hardly to be looked upon even as a work for reference, though it is entirely accurate and authoritative. It is rather a story, fascinatingly told, of the development of that combination of art and science which so intimately concerns itself with the mental and physical welfare of mankind. The writer himself referred to the original lectures as "an aeroplane flight over the progress of medicine through the ages," and Colonel Garrison in the preface to the book says of these lectures that "they are, in effect, a sweeping panoramic survey of the whole vast field, covering wide areas at a rapid pace, yet with an extraordinary variety of detail." Just as one who puts on goggles and helmet and all the rest of the air-man's paraphernalia and mounts into the air, comprehends (as can be possible in no other way) the relative proportion of mountain and valley over which he flies, so the reader who takes passage aboard "*The Evolution of Modern Medicine*" in its capacity of medico-historical aeroplane is permitted thereby a rapid view, such as perhaps no other single work can give him, of the successive mountain ranges of investigation and achievement, and of the intervening chasms of ignorance and superstition (wherein lie bleaching the dry bones of many therapeutic "systems" of olden time) that go to make up the whole vast territory of medical advance from the days of earliest necromancy down to the more rational present.

In its individual subdivisions the work is built up about medicine's great men and the "schools" they founded—either during their lives or after; and those whose names deserve more than passing consideration have been selected with unerring discrimination. The printed text is perfused with many wonderful illustrations of numerous sorts, from originals produced in many epochs and gathered together from all corners of the world. For those before whose eyes this little review is most likely to pass, an especial interest is to be found in the pages devoted to tropical medicine and to the labors of the Medical Corps of the United States Army, of which Dr. Osler was always so true and consistent a friend.

One could wish that "*The Evolution of Modern Medicine*" might be read by all physicians in America. Nothing could more ennoble and dignify in their eyes the calling to which they have devoted themselves; nothing might more inspire them to share in the onward and upward advance of their art.

A. N. TASKER.

**SURGICAL ANATOMY**, by Wm. Francis Campbell, M.D., Surgeon-in-Chief, Trinity Hospital, Brooklyn. Octavo of 681 pages, with 325 original illustrations. Third edition. Price, \$6 net.

Doctor Campbell says in the preface to this edition, which is well revised and has numerous new illustrations, "anatomic accuracy is the key-note of surgical technique," a truth well put but not appreciated by the vastly too many operators (not surgeons) who "cut and tie." If we are to believe the observations of many surgeons—for example, Lovett and Joseph Blake—that, independent of their schools of graduation, the majority of physicians and surgeons educated in the United States are deficient in knowledge of the fundamentals (anatomy, physiology and chemistry) much more than are the medical men of France and England, then something is wrong with our educational bringing-up. A



recent address<sup>1</sup> of Henry S. Pritchett, president of the Carnegie Foundation for the Advancement of Teaching, calls particular attention to the present method of instruction in our medical schools and its failure to carry on the so-called fundamentals of medicine so that their knowledge is appreciated and applied in a proper understanding of medicine at the bedside. The same question is being widely discussed, as instanced at the recent meeting in Chicago of medical educators representing the leading colleges of the country. Surgeons should teach anatomy at the operating table, thus carrying forward the application of the knowledge gained in the anatomical laboratory, and books upon surface anatomy and surgical anatomy should be made familiar to the student in the third and fourth years, and after graduation kept at hand as companion books to the general anatomies of his library.

Among several works upon surgical anatomy, that of Campbell will bear favorable comparison. The author, being a practical surgeon, understands well the anatomical knowledge most essential for the carrying out of a special operative procedure so that anatomical accuracy is the "key-note of surgical technique." The illustrations are good and the text is clear. There can be no trustworthy skill in surgical diagnosis unless based upon an accurate working knowledge of anatomy, and Doctor Campbell has succeeded most admirably in giving us a book founded upon this principle.

JOHN E. SUMMERS, M.D.

ABDOMINAL PAIN, by Prof. Dr. Norbert Ortner, Chief of the Second Medical Clinic at the University of Vienna. Authorized translation by William A. Brans, M.D., formerly Lieutenant Commander, U. S. Navy, and Dr. Alfred P. Luger, First Assistant, Second Medical Clinic, University of Vienna. Cloth, pp. 362. New York: Rebman Company.

Pain as a symptom of clinical significance of abdominal disease is among the most frequent complaints encountered by the physician. The correct interpretation of this symptom in conjunction with other symptoms and physical signs is fully discussed by Prof. Ortner. The causation of pain, its clinical value as an aid in making a differential diagnosis, and its mechanism from an anatomical point of view are described in detail. The author states in his introduction that pain is one of the early symptoms and serves as a guide through the maze of possibilities, and therefore it is to be considered as a starting point in the differential diagnosis. For purposes of description, pain as referred to the anatomical subdivisions of the abdomen is discussed as a clinical picture encountered at the bedside, and the method of arriving at a diagnosis is concisely stated.

The work is based upon the wide personal experience and observation of the author, and most of the diagnoses it contains have been carefully verified by surgical and anatomical procedures. There will be found in these pages many practical observations, and the book will be of interest to every clinician.

L. A. NEWFIELD, M.D.

PRACTICAL THERAPEUTICS, by Hobart Amory Hare, M.D., LL.D., B.Sc., Professor of Therapeutics, Materia Medica, and Diagnosis in the Jefferson Medical College of Philadelphia; Physician to the Jefferson Medical College Hospital; One-time Clinical Professor of Diseases of Children in the University of Pennsylvania; Commander, U. S. N. R. F. Eighteenth edition, enlarged, thoroughly revised, and largely rewritten. Illustrated with 144 engravings and 6 plates. Pp. 1038. Philadelphia and New York: Lea & Febiger. Price, \$6.50.

There is perhaps no other volume on the subject of therapeutics that has met with such universal approval as has this one by Dr. Hare. The present edition has been completely

<sup>1</sup> Anniversary Address, New York Medical Journal, Jan. 4, 1922.

revised and reset in order to bring the book abreast of the most recent advances, as, for example, the use of silver arsphenamine in syphilis, quinidine sulphate in auricular fibrillation, thyroxin in hypothyroidism and the use of the anterior lobe of the pituitary. The sections dealing with transfusion and renal disease have been largely rewritten. The guiding principle has been, in previous editions and followed here, to make the book fill the needs of the practitioner who actually treats patients, and to tell him fully what to do and how. One cannot do better than to follow the teachings of this noted physician who, while holding fast to what has been proved of value in the past, yet gives due recognition to what gives promise to be of therapeutic value in the treatment of diseases.

The fact that this book has passed through eighteen editions shows how great a need this work fills, and words of praise would be mere superfluity. It has and will occupy a place in the doctor's library that no other book on the same subject can fill so adequately.

L. A. NEWFIELD, M.D.



# THE MILITARY SURGEON

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## TUBERCULOSIS AND ITS RELATION TO WARFARE GASES<sup>1</sup>

THE following pertaining to tuberculosis and its relation to the after effects of warfare gases has been extracted from the Report on "The After Effects of Gas Poisoning," by Lieut. Col. H. L. Gilchrist, Medical Corps, U. S. A., Chief of the Medical Division of the Chemical Warfare Service, which has just been published. The material in this report is a result of over one year's investigation during which time every known means was adopted to obtain all available information on the subject, both in this country and in Europe, and included the views of the leading medical men of the world who have had extensive experiences with gas cases during and following the war.

There appears to be a general agreement among the careful investigators that, in scattered populations as are present in this country, 100 per cent will show evidence of infection before they reach the age of thirty, while in the slums it is probable that all children are infected with tuberculosis before they complete their second year.

These results mean but one thing with reference to tuberculosis, namely, that all civilized countries are infected, that in that infection there is ordinarily their protection against subsequent disease, and secondary infections of serious moment do not occur. When tuberculosis becomes a manifest disease it is due, therefore, according to our best physiologists, to the reception of too large an amount of infection at the beginning or to the breaking down of the metabolism of the body, secondary to debilitating diseases or exposure. It, therefore, is not justifiable to assume that any condition, be it gas or other disease, gives rise to an original infection with tuberculosis.

As a result of an analysis of 1,036 applications for compensation filed by ex-soldiers in the Veterans' Bureau, Washington, D. C., it was found that 352 or 34 per cent attributed their disability to the after effects of warfare gases. Of this number 103 did not inhale enough gas to require medical treatment, a large percentage of the number

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<sup>1</sup>Extract from report made by Lieut. Col. H. L. Gilchrist, Medical Corps, U. S. Army, attached to the Chemical Warfare Service.

stating they did not know at the time that they were gassed, and 45 others were so slightly gassed as to require only first-aid treatment.

The following is a recapitulation of this analysis:

*Total number of applications examined, 1,036*

<i>Diseases</i>	<i>Number</i>	<i>Attributed to gas</i>	<i>Per cent due to gas</i>
Tuberculosis .....	554	125	22.5
Bronchitis .....	261	192	73.5
Heart disease .....	156	22	14
Asthma .....	29	12	41.4
Rheumatism .....	12	1	7
Nephritis .....	22	1	4.4

Dr. James A. Miller, who made a careful investigation in relation to this subject, and whose report was published in the *American Review of Tuberculosis*, Volume III, page 354, states that there are fewer cases of tuberculosis today than there were prior to the World War.

Instead of the war increasing the number of tubercular cases, it has lessened them, this being especially true in the different armies, as shown by the following table:

*Tuberculosis in Armies*

<i>France:</i>	
Early months of the war.....	1.75
Last two years of the war.....	.63
<i>Great Britain:</i>	
Before the war, entire army.....	1.1
First seventeen months of war, entire army.....	1.1
<i>Belgium:</i>	
Before war, entire army.....	.35
During the war, entire army.....	.26
<i>United States:</i>	
Regular Army, 1917-1918.....	.75
National Army, during the war.....	.67

COMPARISON OF TUBERCULOSIS AMONGST GASSED IN THE ARMY WITH  
THOSE NOT GASSED

On page 103 of the Surgeon General's Report for 1920, there is found the following paragraph:

One hundred and seventy-three cases of tuberculosis occurred during 1918 among the 70,552 men who had been gassed in action. Of this number, 78 had been gassed by gas, kind not specified; 8 by chlorine; 65 by mustard; and 22 by phosgene. The number of cases of tuberculosis for each 1,000 men gassed was 2.45. Since the annual rate of occurrence for tuberculosis among enlisted men serving in Europe in 1918 was 3.50, and in 1919, 4.30 per 1,000, it would seem to be apparent that tuberculosis did not occur any more frequently among the soldiers who had been gassed than among those who had not been.

The above is a most remarkable showing. In brief, it shows that in the year 1918 there were one and one-half times as many cases of tuberculosis per thousand among all troops in France as there were among those gassed, and that in 1919 there were more than one and three-fourths times as many tuberculosis cases per thousand among all troops as there were among the gassed troops. This means that, if gassing were not an actual deterrent to tuberculosis, the small percentage of tubercular cases among the gassed can only be accounted for through the care of those patients in hospitals.

Two hundred personal letters were addressed to medical officers of the Reserve Corps of the United States Army, the majority of whom had had extensive experience in treating gas cases both during and following the war, with request that they express their views concerning the relationship between tuberculosis and warfare gassing. Of this number, 41 per cent did not reply; 47 per cent were of the opinion that as a rule there was little or no connection between the after effects of warfare gases and tuberculosis; 13 per cent were of the opinion that in some cases relationship existed between these conditions.

Of the replies received from 30 medical officers associated with government hospitals where ex-soldiers are being treated for tuberculosis, 25 stated that with few exceptions there was no connection between gassing and tuberculosis, these officers basing their statements on 16,575 cases which they had seen. Five medical officers who saw 2,030 gassed were of the opinion that there was a relationship between tuberculosis and gassing.

Of replies to questionnaires pertaining to this subject which were sent all over the United States through the different medical associations, 84 per cent were of the opinion that there was no relationship existing, and 16 per cent were of the opposite view.

Shortly after the war a Board of Medical Officers was convened by the Government at Fort Grant, Ill., for the purpose of examining all soldiers claiming disability from the effects of gas. This board was in session several months, during which time they examined over 2,000 cases both individually and collectively, and arrived at the following findings:

1. Gas victims, irrespective of the type of gas and severity of attack sustained, showed no marked predisposition toward active pulmonary tuberculosis, or towards the re-activation of a healed or quiescent pulmonary lesion.

2. That gassed victims presented little evidence of material destruction of lung tissue.

## TUBERCULOSIS IN THE ARMY

The following has been extracted from the Report of the Surgeon General of the Army:

In the year 1918, there were one and one-half times as many cases of tuberculosis per thousand among all troops in France as there were among those gassed, and that in 1919 there were more than one and three-fourths times as many tuberculosis cases per thousand among all troops as there were among the gassed troops.

From the report of Dr. James A. Miller, published in the *American Review of Tuberculosis*, Vol. III, page 51, appears the following:

"There seems clear evidence that tuberculosis has not increased by the influence of the late war upon the armies, and, if anything, it has diminished the hazard of pulmonary tuberculosis, reports from France, Great Britain, Belgium and United States all showing great decrease in tuberculosis during the later periods of the war.

## RESULTS OF LABORATORY EXPERIMENTS

*French:* Two lots of guinea-pigs about the same weight were inoculated with like doses of emulsion of tubercle bacilli in physiological salt solution. One lot served as a control, the others were exposed repeatedly to moderate doses of phosgene 0.5 c.c. per cubic meter during from 5 to 18 minutes every eighth day for 5 months. At the end, nine months after inoculation, 7 of the control group had died, of which 6 showed evident lesions of tuberculosis at autopsy. The 13 survivors were killed and lesions of tuberculosis were found in 7 of them. Of the group which had been exposed to gas, 5 died. Four of these showed lesions of tuberculosis. Of the remaining 15, 10 showed lesions of tuberculosis at autopsy. Therefore, the animals subjected to gas poisoning showed neither more abundant lesions and no greater tendency for these lesions to localize in the lungs than did the control animals.

Judging from this experience, it does not appear that lung lesions caused by gas predispose to tuberculosis, and also that it does not increase the tendency for tuberculosis to localize in the lung.

## REPORT BY THE JOHN MCCORMACK INSTITUTE FOR INFECTIOUS DISEASES

Mustard gas in 0.1 per cent strength in 25 per cent glycerol containing virulent human tubercle bacilli and injected immediately subcutaneously into guinea-pigs entirely prevented the development of systemic tuberculosis in these animals; even 0.01 per cent mustard gas had a distinct retarding influence on the development of tuberculosis in these animals. This action could not be due to the tissue destructive action of the mustard gas in these concentrations, since the same results were obtained in the absence of the ulcers.

THE DOW CHEMICAL COMPANY

MIDLAND, MICHIGAN

March 23, 1921

C. E. RICE.

WAR DEPARTMENT,

CHEMICAL WARFARE SERVICE, U. S. A.,

1800 Virginia Ave.,

Washington, D. C.

GENTLEMEN: In regard to permanent disability from effect of war gases in our Midland Plant, we would state that we had two classes of labor on this work during the summer of 1918, which were engaged in the manufacture of dichlorethyl sulphide.

One was a section of Chemical Warfare Service which consisted of about thirty men, all of which received treatment in the dispensary for burns of major and minor degree. These we have been unable to keep in touch with since they left the city. It would be of interest to have someone visit each one of these men at a period of time to ascertain their condition which might be due to their service on the project. We have had approximately one hundred of our own employees (civilians) engaged in this work, seventy-nine of whom reported at the dispensary for treatment. We have tried to keep in touch with each man since the summer of 1918 in order that we may know his physical condition, particularly in regard to any possible after effects which might be traced directly to contact with mustard gas.

We are enclosing memorandum covering seventy-nine cases which shows that part of body exposed, degree of severity, and the results of the follow-up system, and covers the years 1919, 1920 and 1921 to date. In this memorandum an "O.K." indicates that the man has been seen and apparently is suffering no after effects. A dash indicates that it has been impossible to locate the man.

In interviewing men it has been noticed that the tendency on the part of a considerable number has been a feeling that they should receive some special or extra remuneration on account of the exposure incident to their occupation. We have also had some slight experience with the type that makes the most of an opportunity to malingering.

We would be pleased to furnish you with any additional information that you may seek from our experience in this work. We would also be very glad to know the results of your investigation of the work along these lines.

Yours very truly,

THE DOW CHEMICAL COMPANY,

By DIRECTOR OF HEALTH.

## MEMORANDUM

*Dichlorethylsulphide*

No.	Injury	1918 Degree	1919	1920	1921
1	Throat, eyes, hands	Slight	OK	....	....
2	Eyes.....	Severe	OK	OK	....
3	Hands.....	Slight	OK	OK	OK
4	Feet.....	Severe	....	OK	....
5	Feet.....	Severe	OK	OK	....
6	Hands.....	Severe	OK	OK	OK
7	Leg.....	Severe	OK	OK	....
8	Eyes and hand.....	Slight	OK	OK	....
9	Hands, eyes.....	Malingerer	....	OK	OK
10	Fingers, legs.....	Slight	OK	OK	....
11	Hands, eyes.....	Slight	....	....	....
12	Arms.....	Slight	OK	OK	OK
13	Arms.....	Slight	....	....	....
14	Finger.....	Slight	OK	OK	OK
15	Chest, hands, foot.....	Foot, severe	OK	OK	....
16	Arm.....	Slight	....	....	....
17	Feet.....	Slight	OK	OK	....
18	Arms.....	Slight	OK	OK	....
19	Legs.....	Severe	OK	OK	OK
20	Eyes, face, hands.....	Slight	OK	OK	OK
21	Arms, eyes.....	Slight	OK	OK	OK
22	Arm.....	Slight	OK	OK	OK
23	Fingers.....	Slight	OK	OK	OK
24	Eyes and respiratory organs...	Slight	OK	OK	OK
25	Eyes.....	Slight	OK	OK	....
26	Face.....	Severe	OK	OK	OK
27	Eyes, throat.....	Severe throat	....	....	....
28	Eyes.....	Slight	OK	OK	OK
29	Eyes.....	Slight	OK	OK	OK
30	Arms.....	Slight	OK	OK	OK
31	Arms.....	Very slight	OK	OK	OK
32	Arm.....	Slight malingerer	OK	OK	OK
33	Body, foot.....	Slight (has hernia)	OK	OK	OK
34	Finger, arm.....	Slight	OK	OK	....
35	Eyes.....	Malingerer	OK	OK	OK
36	Eyes, arm.....	Slight	OK	OK	OK
37	Arm.....	Slight	OK	....	....
38	Hand.....	Malingerer	OK	OK	OK
39	Hand.....	Severe	OK	OK	OK
40	Hands.....	Slight	OK	OK	....
41	Arm.....	Slight	OK	OK	OK
42	Leg.....	Slight	OK	OK	OK
43	Hand and arm.....	Slight	OK	OK	OK
44	Chin, hand.....	Slight	OK	OK	....
45	Leg.....	Slight	OK	OK	OK
46	Hands, eyes.....	Slight	OK	OK	OK



*Dichlorethylsulphide*

No.	Injury	1918 <i>Degree</i>	1919	1920	1921
47	Eye, foot, hand . . . . .	Foot, severe	OK	OK	OK
48	Arm . . . . .	Slight	OK	OK	....
49	Finger, hands . . . . .	Slight	OK	OK	....
50	Eyes, chin, hand . . . . .	Slight	OK	OK	....
51	Foot . . . . .	Severe	OK	OK	OK
52	Finger . . . . .	Slight	OK	....	....
53	Eyes . . . . .	Slight	OK	OK	....
54	Hands, throat . . . . .	Slight	OK	OK	OK
55	Hands . . . . .	Slight	OK	OK	OK
56	Legs, fingers, throat . . . . .	Slight	OK	OK	OK
57	Arm . . . . .	Slight	OK	OK	OK
58	Hand . . . . .	Slight	OK	....	....
59	Finger . . . . .	Slight	OK	OK	OK
60	Arm, eye, throat . . . . .	Severe	OK	OK	OK
61	Throat . . . . .	Slight	OK	OK	OK
62	Leg . . . . .	Slight	OK	OK	....
63	Foot . . . . .	Severe	OK	OK	OK
64	Eyes, arm . . . . .	Slight	OK	OK	....
65	Foot, eye . . . . .	Severe	OK	OK	....
66	Hand . . . . .	Slight	OK	OK	....
67	Finger . . . . .	Slight	OK	OK	....
68	Hand, eyes . . . . .	Slight	OK	OK	OK
69	Foot . . . . .	Slight	OK	OK	OK
70	Hands . . . . .	Slight	OK	OK	....
71	Hand, eye, arm . . . . .	Slight	OK	....	....
72	Arm . . . . .	Slight	OK	....	....
73	Ankle . . . . .	Slight	OK	....	....
74	Arm . . . . .	Slight	OK	OK	....
75	Toe, arm . . . . .	Slight	OK	....	OK
76	Eye, throat . . . . .	Slight	OK	OK	....
77	Chin . . . . .	Slight	OK	OK	OK
78	Wrist . . . . .	Slight	OK	OK	OK
79	Lower extremities . . . . .	Very severe	OK	....	....

CLEVELAND, OHIO,  
February 21, 1921.

MEDICAL SECTION,

CHEMICAL WARFARE SERVICE, U. S. A.,  
1800 Virginia Ave.,  
Washington, D. C.

DEAR SIR: I duly received your valued favor of February 16th.

My plant at Bound Brook, which, as you may know, was run as a branch of Edgewood Arsenal, was designed to produce 5 tons a day of phosgene, and did, in fact, operate at that schedule.

Prior to the Government's interest in phosgene, I had been researching on the subject for some two years and had produced semicommercial quantities.

During all this time there was never one serious accident.

When we started the Edgewood plant at Bound Brook, chlorine was sent up to us in poor containers and in the first few days of the plant operation there were bad leaks of chlorine which caused considerable distress to some six or seven men who were, let us say, uncomfortable for an hour or two.

During the time that the government plant was running at full schedule one of the men became affected and required treatment extending over two or three days. We found later that he was a very heavy drinker.

Undoubtedly, if the trouble had swung over to pneumonia and the man had died, phosgene would have been blamed.

One or two of the young chemists who went through the research, and also through the later production period with me, got, from time to time, little doses of gas.

Personally I had, in all, three pretty heavy doses. My greatest discomfort was the tobacco reaction.

I know little or nothing of medicine, my scientific work being confined to chemistry and engineering, but I cannot, after some three or four years' work in the production and application of phosgene, understand how it could cause permanent trouble.

There is, of course, no doubt that if a man worked year after year around apparatus producing phosgene and breathing an atmosphere vitiated with this gas, even in a dilute form, his health might suffer.

I have seen a man fall absolutely unconscious as though he had been struck with a club upon getting one full breath of air heavily charged with carbon monoxide. He was carried to the hospital and given oxygen by the surgeon and before very long was quite all right.

In a case like this I understand the doctors watch the heart very carefully.

Phosgene does not act this way. There is a tremendous reaction in the nose and throat, coughing and choking, all of them acting as warnings; but in my own case I have found that after the local conditions have been cleared up by inhaling the chloroform and ammonia mixture and the heart was returned to normal after the carbon monoxide blood reaction has been overcome, then I am normal in every way and quite comfortable.

As a matter of possible interest to you, I may tell you something of the psychology of the situation at Bound Brook.

We simply could not hold our men and it was impossible to engage new ones. Money was not the consideration; they were just afraid.

Then it occurred to me to get out a little leaflet to be read by each man in the employ and by any new men we might desire to engage. The heading, which was in large type, read: "Do you want to do your bit," and at the very end, in equally large type, were the words, "Or are you a quitter?" In between was the frank admission that the work was dangerous, and the statement that, so far, we had not lost a man.

There was a brief reference to the fact that the brothers and sons were, in many cases, risking their lives each and every day in the trenches in France for \$30 a month for the protection of a bunch of

fellows at home pulling down \$50 and \$60 a week or more, and afraid to take a one in a hundred danger chance for the country's good.

I am sorry indeed that I have not got a copy with me of the leaflet, for it worked like a charm. After each man in the factory had come into my private room and read the thing with me I got him to sign an agreement that he would not quit the factory on less than two days' notice and would always give to me or to the government official his full reasons for leaving. After that was done we heard practically nothing of the effect of gas and, as a matter of fact, as far as I know, there has been no claim against the Government by any of the boys who worked at the Bound Brook plant.

I may be wholly wrong, but after a considerable experience with phosgene (and I have nothing at all to say about mustard gas, for I didn't work in it) it is my feeling that long before a man could inhale a sufficient dose of the gas to in any way cause permanent injury by reaction on any of the tissues or organs, the carbon monoxide heart reaction would kill.

Please understand that these are just my personal views and are not official in any way.

Yours very truly,

F. HEMINGWAY.

VIEWS OF OUR ALLIES, ALSO THE GERMANS AND SWISS CONCERNING THIS  
SUBJECT

*The British*

It must not be forgotten that the British troops received the first installment of warfare gases and suffered thousands of casualties because they were not prepared to combat the effects of this method of warfare. As a result their first casualties were very severe, resulting in heavy mortalities. The following is taken from their report:

(a) There is happily every reason to think that only a very small percentage of gas casualties of the war will suffer any permanent disability.

(b) The relation between tuberculosis and gassing: Tuberculosis does not develop more frequently in gas victims than in other subjects.

*The French*

In the majority of cases of secondary tuberculosis, it seems to be simply exacerbations of old infections which have been more or less latent. Judging from experience it does not seem that lung lesions caused by gassing predispose to tuberculosis.

*The Germans*

The best available authority in Germany, the pathologists for the Kaiser-Wilhelm Academy, who have made a special study of the after

effects of gas poisoning, state that there are few remote effects resulting from exposure to warfare gases.

The German physicians, both those who are in the service at present and those who were in the service during the war and who are now engaged in private practice or government work, agree unanimously that gassing has no connection with tuberculosis.

#### *The Swiss*

Professor Stachlin of Switzerland searched through all the chronic diseases occurring among prisoners of war interned in Switzerland and with but few exceptions could he find any suffering from the results or effects of gas poisoning.

#### CONCLUSIONS

As a result of this investigation, the following conclusions have been drawn:

1. As to the incidence of pulmonary tuberculosis resulting from exposure to gas, it would seem that it is far from convincing that gas played any particular rôle in this connection, and it is doubtful if the incidence of lung tuberculosis among ex-service men is much greater by reason of the part that gas played.

2. Those who claim to have developed tuberculosis a year after leaving the service, from conditions experienced in the Army, certainly have no basis for such assertion. They probably would have become tuberculosis patients even if they had never been in the Army.

3. There are two elements entering into this problem—one neurasthenic, where the men have been gassed, usually very slightly, and believe sincerely that this is a factor in any illness; and second, mistaken diagnosis in many cases, especially those following influenza, in which instances of unresolved broncho-pneumonia occurred in nodular patches and in which the diagnosis of tuberculosis was frequently based on X-ray plates.



# COLUMBUS BARRACKS MEASLES—STATISTICAL ANALYSIS

BY MAJOR H. H. RUTHERFORD

*Medical Corps, United States Army*

DURING the years 1910 to 1913, inclusive, Columbus Barracks furnished 78.4 per cent of all the deaths from measles in the Army in the United States, and from January, 1910, to date (April, 1915), a total of 48 deaths from measles have occurred at the depot.

The disease was generally of a mild type, but at Columbus Barracks, Ohio, it assumed a decidedly malignant character. The infection was introduced about the middle of December, 1898, and from that time to May 16, 1899, there occurred in the garrison 74 cases, of which 12 proved fatal, mostly from pulmonary complications.

The disease was so scattered among the several barracks as to warrant the belief that the infection in each case was derived from the city.

In March and April recruits poured in rapidly, until a strength of 1,647 men was reached.

Forty-four of the 74 cases were received from barracks No. 57, occupied by about 540 men.

During the year 1911, 1,101 cases of measles occurred in the United States, with 25 deaths. Three hundred and ninety-two of these cases, with 18 of the deaths, occurred at Columbus Barracks, Ohio. (Extracts, Surgeon General's Reports.)

TABLE 1.—RELATIVE INCIDENCE OF MEASLES, CASES AND DEATHS THEREFROM, IN THE UNITED STATES AND AT COLUMBUS BARRACKS

United States			Columbus Barracks			
Years	Cases	Deaths	Cases	Per cent total, U. S.	Deaths	Per cent total, U. S.
1910.....	317	3	69	21 0	3	100 0
1911.....	1,101	25	392	33 0	18	72 0
1912.....	426	12	201	45 0	12	100 0
1913.....	457	11	61	14 3	7	63 6
Total.....	2,301	51	723	.....	40	.....
1914.....	.....	.....	49	.....	2	.....
1915.....	.....	.....	61	.....	6	.....
Total.....	.....	.....	833	.....	48	.....

The majority of cases occurred during winter months and most deaths in cases incident at, or shortly subsequent to, the height of

epidemics. The magnitude and malignity of epidemics generally, *but not always*, bore a direct and constant ratio to recruit population; and thus far the only measure to effectively check an epidemic has been that of depopulating the depot.

*Nativity and Immunity.*—Case incidence, complications and deaths at this depot have occurred with great preponderance among recruits of southern birth. The absolute ratios for case incidence, considering all cases since January, 1910, to date (April, 1915), being: Southern recruits, 79.17 (South) to 20.83 (North) per cent of the total of 850 cases. Also the relative complications and deaths in measles among southern recruits were decidedly greater than among recruits from elsewhere—of the former 25.26 per cent developed complications and 5.94 per cent died, whereas in the latter the figures are 15.25 per cent complications and 4.52 per cent deaths.

The percentage of non-immunes among the recruits of this depot is large, doubtless larger by far than are the percentages of such at Fort Slocum and Jefferson Barracks. The percentage of recruits who are non-immunes to acute contagions, exanthems and catarrhs, in particular, is greater at this than at the other depots. Recruits from southern states are less mature, less immune and less acclimated than are recruits from northern states and elsewhere; on joining the service they are less competent to take part in the battle for life than are their comrades from northern metropolises.

*Columbus Barracks receives more southern recruits than all other depots.*

At enlistment a considerable number are plainly undernourished and their physical resistance at a low ebb. They are young non-immunes in the broadest sense, "new boys," unused to rigorous seasons such as the winters of this locality, facing for the first time the necessity of contending with the multiplicity of infections that arise from innumerable close contacts.

On the other hand, infecting agents find conditions highly propitious. The strains of the common pyogenic organisms passing through man after man, during these months of greatest congestion in barracks, enhance, until shortly the acme of virulence is attained. That is to say, in the month of December, all recruits have colds, sore throats and coughs; and subsequently, as experience has shown, during the months of January, February, and March, streptococcic infections become promiscuous and exceedingly virulent. Finally, if, during these winter months, the natural thing comes to pass and measles breaks out, what more natural than to find, as we do, serious and fatal streptococcic

complications, initiated by the conditions of measles—violent bronchial catarrh with fever and prostration?

That the presence of the virulent strain does not depend upon measles is shown, or at least was shown this year, by the fact that one case of fatal influenzal streptococcic bronchial pneumonia, another following a major surgical operation, and a third case (not fatal) of most serious wound infection, all occurred shortly prior to the outbreak of measles.

*Numbers and Housing.*—The size of the recruit organizations and the system of housing at this depot tend strongly to aggravate other evil conditions. The evil effects of housing comparatively large bodies of men in one large building with large squad rooms is most strikingly illustrated in the case of a three-story building containing three company barracks.

Considering the sick records of the three companies occupying this building (No. 57), it is necessary to point out that it is in as good general condition of repair as are at least two of the buildings occupied by single companies; that the three companies are quartered on separate floors; that each floor has its separate lavatory and toilet; each floor can be entered separately from the outside; the squad rooms in this building are no more crowded than are those in other buildings; and finally, the recruit members of the companies in this building are in no wise different from those of other companies. On the other hand, the fact that three companies live in such proximity facilitates an increased number of contacts. By reason of proximity of their barracks, men in one company will make acquaintances in another. Visiting from squad room to squad room is facilitated, and it is practiced by members of these companies. Also, whereas each of the three barracks has a separate entrance-way, the building also has a common inside entrance and set of stairs, which can be and is used by the three companies in common.

In short, in so far as housing is concerned, these three companies amount to one organization living in a common barrack, and the condition is resolved into the following formula: The more men the more contacts; the more contacts the more acute infections; the more acute infections the more exalting of virulence of infecting organisms, etc.

This basis of explanation would seem the most reasonable, not only for the greater malignity of sickness in building No. 57 but for the malignity, in general, of Columbus Barracks sickness. In recruit depots such as this, organizations are abnormally large, some companies, as can be seen by reference to tables, averaging 300 in strength at certain most ill-conditioned times—times when great numbers of con-

tacts are most prolific of danger. *Columbus Barracks houses much larger numbers of men in single buildings than do the other depots.*

To say the ratio of danger is direct to degree of crowding is not so significant as to say the ratio of danger is direct, and progressively so, to that of *increased numbers* in close and continuous contact. *The factor of numbers is of equal if not greater importance than that of the condition of crowding.* Two men may be crowded, but the same two men with 2,000 men under conditions of inordinately less crowding will be in conditions of inordinately greater danger.

*Hospital Facilities.*—Though records of the 1915 epidemic tend to show very strongly that the infections causing the complications existed prior to the outbreak of measles, it is nevertheless believed that the lack of more adequate facilities for handling the cases was, and always has been, a distinct factor in the development and in the serious results of measles complications. A case in instance occurred some years ago and is described in the Surgeon General's Report as follows:

Measles appeared at the Presidio, San Francisco, California, about the middle of December, 1901, the first case being admitted to the General Hospital at that place on the 17th of the month. During the rest of the month 8 other cases were received. The epidemic spread with considerable rapidity, 73 cases being admitted in January, 1902, 79 in February, and 116 in March. During April, there was a falling off to 82 and a further decrease in May to 24. By June 1 the epidemic was practically at an end.

Previous to March 21 these cases were treated in two large buildings, which had served as barracks. Each of these buildings contained one large and two small squad rooms, accommodating 35, 12 and 8 beds, respectively.

In time these rooms became much overcrowded owing to the rapid extension of the epidemic and to the adoption of the rule requiring patients to remain under surveillance in hospital until thirty days after the onset of the disease. It was found necessary to make this rule because of the susceptibility of these patients to broncho-pneumonia, especially when subjected to the exposures incidental to camp life in this locality.

The difficulty of treating the men was also increased by the fact that many of them were recruits who had not yet learned the essentials of personal cleanliness and care of the squadroom. According to a report by Col. A. C. Girard, in command of this hospital, the nursing of patients was acceptably performed by members of the Hospital Corps until February 13, 1902, when it became possible to give the care of the sick into the hands of trained female nurses. There was thereafter a marked improvement noticeable in the care and management of the wards, comfort of the patients and discipline of the men. Under the charge of Hospital Corps men it seemed impossible to prevent the untrained patients from expectorating freely upon the floor, a practice which was followed by a surprisingly large number of lung and ear



complications. To show the probability of infection from this source it is interesting to note that no case of broncho-pneumonia and very few ear complications arose in the wards which were disinfected and placed under the charge of female nurses.

In the case of Columbus Barracks the hospital facilities have been the same as at present during the entire period covered by the data of this report (with one exception—the epidemic of 1899). That part of the hospital used for handling measles cases comprises two 16-bed and four 4-bed wards, a total of 48 beds, with  $112\frac{7}{12}$  feet of floor space per bed. The wards are situated on the fourth floor and have a 10.5-foot ceiling with mansard windows. The ward equipment is regulation and complete.

Nursing is performed by members of the Hospital Corps and is very crude. That is to say, the very large majority of the nurses are woefully lacking in technical knowledge and skill, and, if they were qualified to do aseptic nursing, the sudden influx of such large numbers of acute violent cases would greatly tax their capacity.

Third or top floors of all buildings in this depot appear to be the least desired and the most uncomfortable floors during winter weather. The reason given by the older soldiers of the permanent command are that top floors are the most difficult of heating and that they catch more smoke and air debris from the railways and factories. It is certain that such applies to the hospital top floor. This year's record of the 26th Company occupying the third floor of building No. 57 would indicate that the third floor of that building, at least, is the most unhealthy one.

*Vaccine in 1915 Epidemic.*—This year, since virulent streptococcic complications have been the invariable rule, streptococcic prophylactic vaccine was undertaken. The results, though by no means satisfactory or conclusive, are thought of enough significance to justify report. In the beginning there were circumstances that compelled delay; an adequate vaccine had to be prepared and tested—a vaccine from a strain which could reasonably be assumed to be the one we were endeavoring to combat. There being no case of measles-streptococci on hand, a vaccine was prepared from the pleural pus of a recent fatal case of streptococcic pneumonia. This vaccine was standardized and put into use on the first cases that came into the hospital. Beginning with one case on the fifth day of disease and the first day after deferescence, a dose of approximately twenty-five millions was given. There was no reaction, and on the following day doses of fifty million were given to three patients. Following this at intervals, the dose was increased, always taking new cases, until four to five hundred million

organisms were given per dose. The stage of disease was taken earlier, with the incidence of new cases, so that finally the method settled upon was: *Immediately after the height of the measles (all things being equal), give each patient a dose of from two to three hundred million organisms.* The tabulation of cases is supplemented by a series of clinical charts designed to show some of the probable effects and results of the vaccine.

Comparison of incidence, rate of complications and deaths therefrom in this epidemic, with those of previous ones, possesses most value when the cases considered are those occurring during corresponding months. Also fairness demands that any other palpable factors be taken into account. Reference to Charts I and II and report of Captain Kilbourne (see Surgeon General's Report, 1913) indicate that conditions in general, at the outbreak of the epidemic of this year, were unusually favorable for numerous and serious complications. The population during the months just preceding, as well as at the time of the outbreak, was much greater than ever before in the history of the depot. The outbreak occurred the first of February, the month which has invariably furnished the greatest number of fatal cases. There were other conditions present to favor malignancy. Prior to the outbreak of this epidemic the command had been suffering from a severe epidemic of influenza, cases of which developed complications identical with the usual fatal complications of measles, viz., streptococcic broncho-pneumonia. In this year's measles the manner of the outbreak and the character of the manifestations had significance. The cases came down in crops, so to speak, 17 cases in the first five days, the fifth to tenth of the month; a few straggling cases thereafter for a week; then within another five days there developed 36 cases, almost as though their exposures had been simultaneous. The manifestations were markedly violent, exanthem and catarrh of mucous membranes unusually intense. In the measles wards there was constant coughing day and night for three weeks, not by one or two men, as though in relays, but by one or two dozen men in relays. The temperature curves, submitted herewith, will serve as a fair index to this violence. Subsequently, when the acute catarrh of the measles subsided, fully 50 per cent of the cases developed complete aphonia, which in many cases persisted for weeks.

As illustrative of the nature and virulence of the infections in the cases of complications, it is noteworthy that in every case coming to autopsy cultures from heart blood gave pure streptococci growths.

Reference to Chart I and tables will show that in numbers of complications and deaths the epidemic of 1915 was lower than the average of previous epidemics covered. This may or may not have been due to the effects of vaccine, but in the opinion of the writer there is no contra-

indication to its further trial, and there exists some reason to believe its use will prove of material benefit.

As to the practical solution of the problem of Columbus Barracks sickness, it would seem that no complete one offers, short of a radical change in the method of handling recruits. This study was designed only to furnish some explanation of the causes.

*N. B.*—This study, with tables and charts, was sent to the Surgeon General's Office in 1915. Copies of tables and charts that were retained have been lost.



# MUMPS: EPIDEMIOLOGY AND INFLUENCE OF THE DISEASE ON NON-EFFECTIVE-RATE IN THE ARMY

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(With three illustrations)

MUMPS (*mompen*, to mumble) is a specific infectious disease characterized by swelling and tenderness of the salivary glands, fever, metastasis to other organs, and by varying involvement of the entire economy after the manner of the general diseases.

Other names which have been applied to this disease entity are: Parotitis epidemica (international nomenclature), parotis, parotitis, parotiditis, cynanche parotidæa, parotid bubo, idiopathic parotiditis, parotitis contagiosa, metastatic parotitis; French: oreillons, ourles, fièvre ourlienne, parotide epidémique; German: Ziegen-peter Bauer wetzal.

Hippocrates (460-375 B. C.), in his history of epidemic diseases described mumps in the following language, evidence that the disease was then prevalent with about the same virulence and type as that of modern years, and that parotitis, fever and orchitis were recognized as its manifestations:

. . . at Thasus . . . were but few inflammatory fevers, and these were of a mild type . . . there were many which were accompanied with tumors behind the ears, sometimes on one side, sometimes on both. These happened likewise to many persons who were walking about and free from fever, though a slight temperature attended most of them. None of these tumors were injurious; nor, as is usual with such as arise from other causes, did any of them suppurate; but they were of a lax nature, large and much diffused, without inflammations or pains, and soon vanished without any concomitant sign. They affected children, young persons and adults, and especially those who exercised much, yet but few women. Many persons were troubled with dry coughs, they spat but little, nor were these coughs accompanied with hoarseness. Many at this time had inflammations, attended with pains, break out in one or both testicles, with or without fever. In some these complaints were very troublesome, but in others, who did not require the care of a physician, they were quite trifling.

Notwithstanding this ancient recognition of the disease, it was not until the middle of the eighteenth century that epidemiological observations appeared; then epidemics were placed on record in various countries—Switzerland, France, Germany, Scotland, and especially widespread epidemics in Italy through the last half of the eighteenth century, which established the question of contagiousness beyond doubt. During

the first half of the nineteenth century many reports of epidemics appeared, chiefly from institutions (prisons, orphanages and boys' or girls' schools), military garrisons and ships at sea.

The statistical data available of the incidence of this disease is chiefly of military source, especially war time, for it is to the military, naval and institutional medical officer that mumps presents a problem as important as that of the more formidable diseases, by reason of the epidemic proportions, non-effectiveness and even complication incidence. "In terms of sick wastage, and measured by the number of days lost from military service on account of sickness, mumps was the most important disease in the American Expeditionary Forces (France)."(1)

#### INFLUENCE ON NON-EFFECTIVE RATE IN ARMY (2)

The incidence of mumps in the United States Army (white troops) over a long period of years is shown in Chart I, in terms of the annual admissions per 1,000 strength. It will be noted that in peace years the rate was usually below 10, but that in war years the rates became excessive, especially in the Civil and World wars; the low rate of pre-war years increased in the war years 1917-18 to several times the normal rate, and in 1920 returned again to the normal rate of 10 per 1000. An exactly similar rise occurred during the Civil War. Mumps is one of the few diseases in which incidence was greater in the World War than in previous wars, an index that the methods of preventive medicine have not yet conquered the problems of this disease as they have in several other preventible diseases whose rates were made minimal or negligible by the application of developed sanitary and protective measures.

The significance of the high world war rate is analyzed in Table I. During the three-year period there were placed on record 231,490 cases of mumps, which represented 6.5 per cent of all disease admissions. In each 1,000 troops there were 2.5 constantly non-effective from mumps, this being 6.3 per cent of the total non-effectiveness from all diseases. Expressed in other terms, there were 3,540 men constantly non-effective for three years from mumps alone. Each patient averaged 16.8 days non-effective.

These figures are all higher for the year 1918, the vital year of the war, when any loss of man-power was a critical thing, especially overseas. During this year 168,519 patients were admitted for mumps, an annual rate of 67 per 1,000 troops, a rate exceeded only by influenza and representing 7 per cent of the total disease admissions. There were during this year, 8,020 men (about three war-strength infantry

regiments) constantly non-effective, 3.2 per 1,000, and each patient lost 17.4 days non-effective. The admission rate in the United States, 75 per 1,000, was exceeded by three diseases, influenza, gonococcus

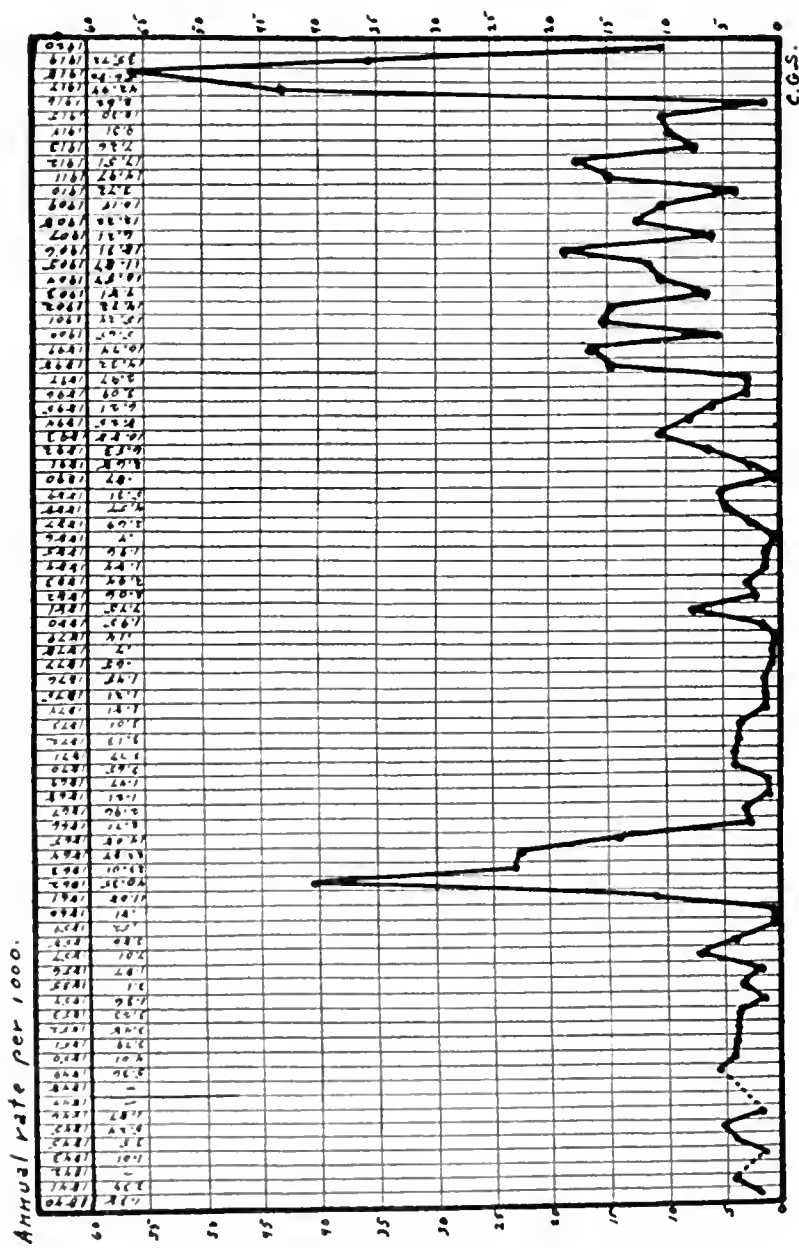


CHART I.—Admission rates for mumps, white troops, U. S. Army, 1840-1920.

TABLE 1.—ADMISSIONS AND NONEFFECTIVENESS FOR MUMPS, IN U. S. ARMY, 1917-1919

	1917			1918			1919			Total, three years		
	In U. S.	In Europe	Total army	In U. S.	In Europe	Total army	In U. S.	In Europe	Total army	In U. S.	In Europe	Total army
Mumps admissions	21,725	3,747	26,970	104,290	60,136	168,519	16,538	17,932	36,001	142,573	81,815	231,490
Annual rate per 1000	38.9	82	39.7	75.5	57.5	67	49.6	31.4	35.8	63	49	55
Per cent of total admissions for disease	4.4	11	4.7	6	10	7	0.5	0.5	0.5	5.7	9	6.5
Mumps rate exceeded by	Mumps, influenza, gonococcus infection	Influenza, brouchitis	Mumps, influenza, G. C. infection, bronchitis	Influenza, G. C. infection, bronchitis	Influenza	Influenza	Brouchitis, acute tonsillitis	Influenza, gonococcus, brouchitis	Influenza, brouchitis, ac. tonsillitis			
Days lost	254,523	40,994	316,020	1,738,071	1,126,344	2,926,635	290,146	333,633	655,149	2,288,740	1,500,971	3,891,814
Ratio per 1000	1.25	2.5	1.3	3.45	2.95	3.2	2.4	1.6	1.8	2.5	2.5	2.5
Per cent of total non-effectiveness												
Mumps admission rate exceeded only by	Mumps, gonococcus infection	None	Mumps, gonococcus infection	Influenza, gonococcus infection	Influenza	Influenza	Influenza, gonococcus infection	Influenza, gonococcus, brouchitis	Influenza, G. C. infection, brouchitis	6.3	6.4	6.3
Days lost per admission for mumps	11.7	11	11.7	17.4	18.4	17.4	17.0	18.0	18.2	16	18.3	16.8
Constantly non-effective	697	112	806	4,760	3,040	8,020	812	912	1,795	2,090	1,370	3,540

TABLE II.—ADMISSION RATES FOR MUMPS, IN U. S. ARMY, FOR YEARS  
1906-1915, BY MONTHS  
ANNUAL RATE PER 1,000

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1906	27	36	57	39	22	15	6	2	3	0.8	1	0.4
1907	2	7	15	25	11	7	2	0.5	0.5	0.7	1	7
1908	16	30	38	22	16	6	3	1	2	4	4	2
1909	8	21	32	26	13	8	3	0.6	0.6	0.8	1	0.5
1910	4	3	8	7	4	6	4	1.3	1	1.1	1	2
1911	8	23	43	41	24	10	5	0.8	1.7	4	5	8
1912	13	23	46	52	29	12	8	2	3	1.5	6	10
1913	14	7	16	18	14	7	3	3	5	1	2	2
1914	10	21	35	18	11	5	2	1	0.4	0.5	0.1	1
1915	13	26	38	26	12	4	0.6	0.8	0.1	0.1	0.4	0.5
Average	11.5	19.7	32.8	27.4	15.6	8	3.7	1.3	1.7	1.4	2.1	3.3

TABLE III.—ADMISSION RATES FOR MUMPS, U. S. ARMY, APRIL, 1917-  
DECEMBER, 1919, BY RACE AND NATIVITY

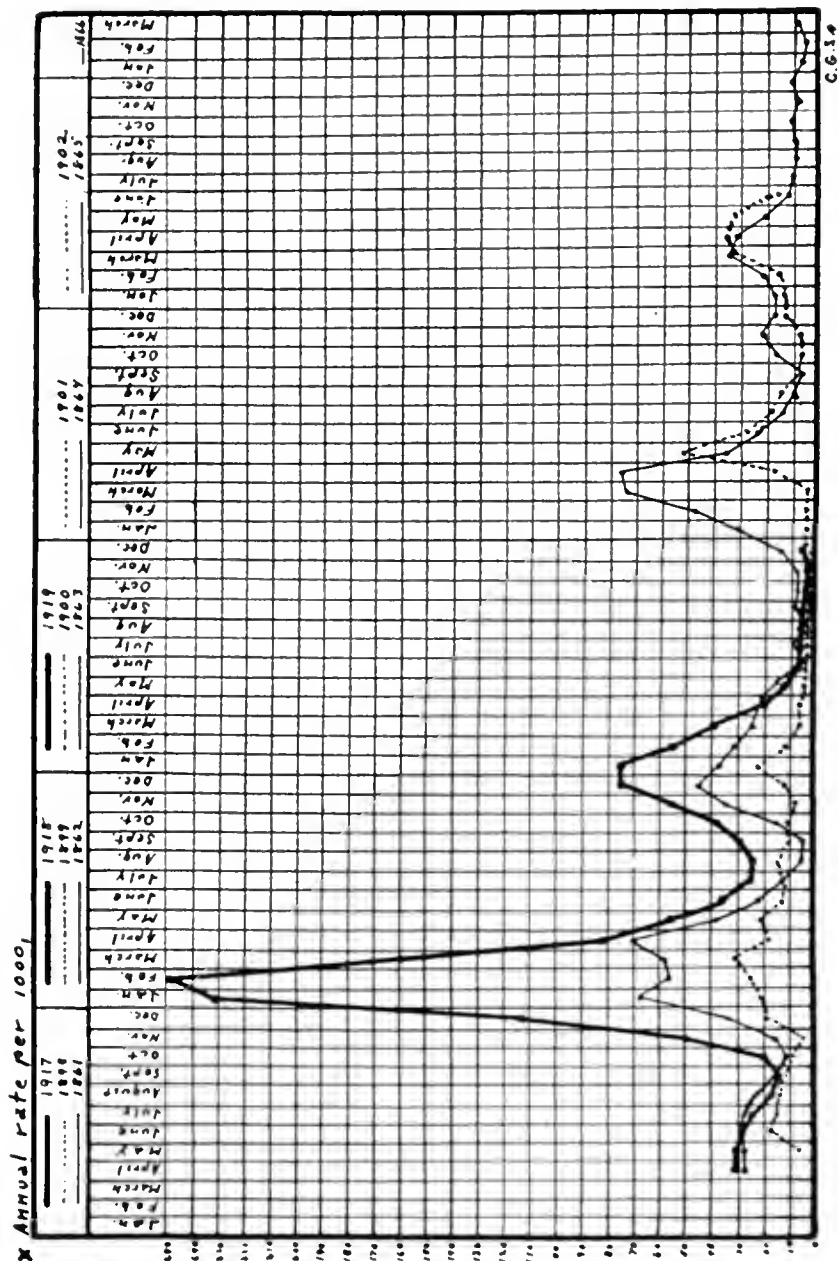
(Percentage of Rural Troops from Each State is Entered for Comparison)

RATE—ANNUAL, PER 1,000

	White	Colored	Per cent rural troops		White	Colored	Per cent rural troops
Mississippi	221	184.4		California	36.8	45.4	48
Arkansas	163.3	100.6	97	Washington	36.1	98.2	68
Alabama	163	152.6	82	Utah	35.6	69.4	72
Georgia	157.3	216.9	84	North Dakota	34.3	120.5	
Tennessee	157.2	73	81	Colorado	34.8	90.4	75
South Carolina	133.8	162.5	87	Maine	34	87	90
North Carolina	128.3	119.6	96	Michigan	34	16.7	54
Texas	131.9	112.4	85	Illinois	33.4	13.8	43
Kentucky	103.4	67.3	85	Idaho	32.5	44.9	
Louisiana	101.7	133.76	82	New Hampshire	26.1	120	
Virginia	101.1	100.5	79	Arizona	23.2	133.3	
Florida	136.4	126.7	82	Ohio	31.6	23.1	46
Kansas	92.7	63.2	90	Nevada	21.3		
Nebraska	83.3	26	80	Wyoming	25.8		
Missouri	74.8	43.9	60	Maryland	16.2	39.3	43
Iowa	74	29.5	84	Montana	17.1	42.8	91
Indiana	58.5	20.2	81	Pennsylvania	15.8	12.5	50
Vermont	61.3	304.3		Delaware	14.5	42.5	41
West Virginia	55.7	24.1	95	Massachusetts	11.5	28.7	50
Oregon	61.8	78.4	71	New Jersey	11.5	17.3	23
Wisconsin	43.6	62.2	66	District of Columbia	10.9	15.8	
Oklahoma	44	62.6	66	Connecticut	11.2	20.15	54
Minnesota	43.4	26.6	96	Rhode Island	9.3	22.2	
South Dakota	54.1	237.3		New York	8.4	15.4	41
New Mexico	39.1	140		Alaska	7		



infection and bronchitis; the European rate of 57 per 1,000 was exceeded only by influenza. In Europe there were constantly non-effective in



1918, 3,040 troops, considerably more than would make a war-strength regiment of infantry.

Charts II and III and Tables II and III were compiled to show the distribution of mumps by season, color and race, in peace and war years, and are discussed under these headings below.

#### DISTRIBUTION

Mumps has a world-wide field of action and has given no evidence of geographical or climatic predilection. Although most recorded epi-

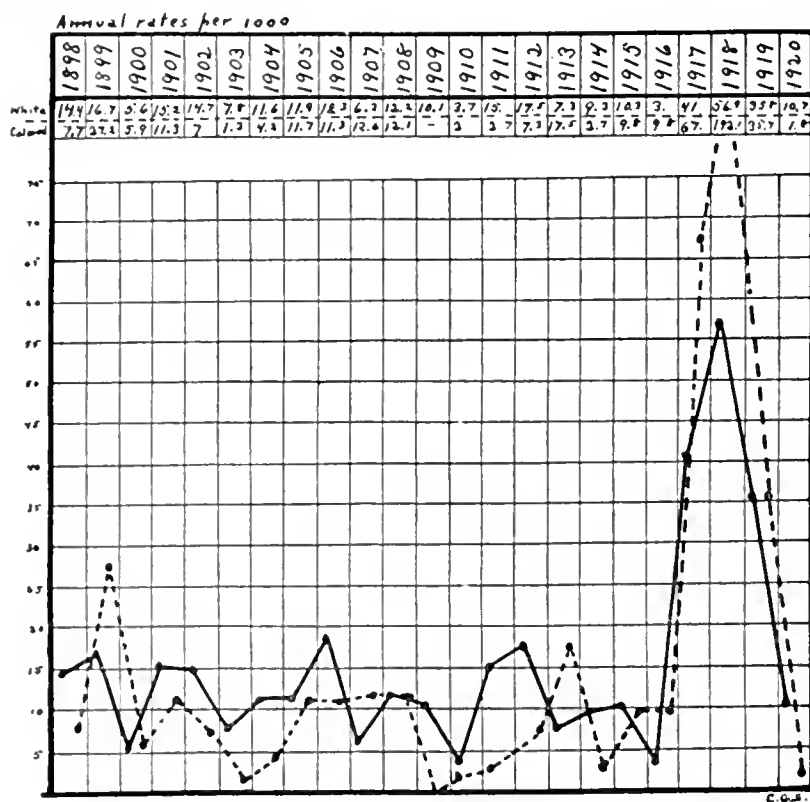


CHART III.—Admission rates for mumps, U. S. Army, 1898-1920, by race.  
 ————— White troops; - - - - - Colored troops.

demics have been in the more densely populated countries, especially from their institutions and military forces, it may be considered that the dissemination of infection is dependent not on country, latitude, or climate, but on forces, sometimes secondary to climate or country,

which promote conditions in the populations suitable for epidemic spread.

#### NATIVITY

Urbanity, as with other contagious diseases, has manifest influence on incidence; provide two populations under equal conditions, one of rural nativity and the other of urban nativity, and the former population will encounter the more severe epidemic. This is a factor not of nativity itself but of former exposure and immunity, the urban population having had, by former frequent exposure, the active immunization (disease) of the susceptible individuals. Certainly conditions of normal rural life do not favor acquiring the disease, and rural epidemics do not occur; but the massing of these rural susceptibles on occasions of military mobilization serves as a nidus for epidemic in which, in the resultant massive contagion, not only the susceptibles but the relative immunes become attacked.

Table III compiles the distribution of mumps admissions during the World War according to native states. The southern states (rural) are all at the top of the list, having very high rates, the New England and eastern states (urban) are at the bottom with low rates, and the central and western states occupy intermediate positions generally in proportion to ratios of urbanity to rurality.

The average mumps rate (peace-time) in the French Army is almost double that in the United States Army—referable to the frequent increments of rural susceptibles furnished by their systems of universal military training. The English Army (peace-time) rate is very low, also probably referable to their conditions of enlistment, which does not provide the same large increments of susceptible troops for infection.

Mumps, as an epidemic disease, requires group massing for contagion, and any force promoting group massing and increasing direct contact of individuals will promote the contagion. In civil communities epidemics are infrequent; sporadic cases occur, but even the association of children at school and at play and of adults in daily routine does not provide mechanisms of epidemic development; secondary cases will, as a rule, be limited to that person's household. When the household becomes large, as in orphanages, boys' and girls' schools, etc., where direct contact is intimate and frequent, an epidemic prevails. But contagiousness is sufficiently slight that even there epidemics are quite readily controlled; the observation has been repeatedly noted that an uninfected section of the institution may be kept from infection by avoidance only of gross contact—that in a family household simple segregation of a case and avoidance of gross contact is adequate to prevent infection of rest of family.

The conditions of army or naval garrisons, ships and camp, and especially in time of war, provide just the requisite conditions for the transmission of this disease—massing of susceptible material, and frequent direct and intimate contact of individuals with the resultant epidemic proportions as soon as the virus is introduced. In non-war years there is a fairly stable status of non-susceptibility among the troops, the recruit depots only presenting the favorable conditions, and only sporadic cases appear. War time and rapid mobilizations of large bodies then favor epidemics.

Other than as controlled by war, mumps varies little from year to year, or from decade to decade, either in incidence or in virulence.

#### RACE

Race has a decided influence on incidence, but how much of this is racial susceptibility and how much is nativity is difficult to estimate, but it is quite probable that the differences in color incidence recorded in Chart III is due to nativity, the colored populations being of far greater rurality than the white.

Interpretations of color susceptibility from army incidence in the two races require due consideration of two contrary forces—favoring a higher incidence among colored troops is the greater rurality factor of the southern negro, but contrary to this is the long enlistment period, and consequent fewer young recruits in the colored regiments, tending toward low rates. Chart III, showing mumps admission rates in the U. S. Army, by race, for a period of years, shows the resultant balance of these forces in the two races. In the peace years the rate for colored is generally lower than the white rate, but in war years, with enlistment of many rural colored troops, their rate became over triple the white rate. It may be presumed that race itself does not predispose to mumps infection, but that difference of rates, when present, is one of nativity and of previous exposure. This view is favored by the observation that colored troops from the District of Columbia (urban) had very low mumps incidence—16 per 1,000 in colored, 11 in whites.

#### SEASONAL VARIATIONS

Mumps shows a distinct preference for winter and spring months; at least 70 per cent of epidemics occur in these months. Table II of rates in the U. S. Army (peace years chosen as containing least disturbing forces) for a period of ten years shows the highest rates were invariably in March or April, and the lowest invariably in the autumn. This seasonal variation requires only consideration of the closer indoor contact of troops in the winter months, the long incubation period passing high rates over into the spring months.

Chart II shows the monthly incidence in the Civil, Spanish American and World wars. The maximum occurred in the winter of 1918 (January and February) with lesser rise the following winter (December and January) and the lowest rates in the summer months. In the Spanish American and Civil wars occurred similar, though less, winter maximum, summer minimum, the former being sometimes extended over into the early spring months.

#### AGE AND SEX INCIDENCE

Military records, having for consideration practically only male adults of limited age groups, cannot give a reference to relative age and sex distribution of mumps; and civilian statistics, with incomplete reporting, especially of adult cases, give erroneous impressions of incidence. However, the military records, as a bulk consideration, do demonstrate the susceptibility of adults—certainly military rates in war years are higher than ever occur in child populations! No age is exempt, but with one attack giving relative immunity from future attacks, the proportion of susceptibles decreases with age. The distribution among age groups is probably entirely dependent on factors of exposure and acquired immunity.

Sex has no influence on incidence. It is often affirmed that mumps attacks males more frequently than females—in army hospitals it has been remarked that at times nurses are seldom attacked whereas male attendants become infected, presumably because nurses as a group have had more prior exposure to mumps and have a higher ratio of acquired immunity. Consideration of mass records reported over period of years shows about equal involvement of sexes.

#### SUMMARY OF DISTRIBUTION OF MUMPS

1. World wide. All nationalities attacked.
2. Marked winter and spring incidence.
3. All ages attacked.
4. Sexes equally susceptible.
5. Colored race rates higher than white race rates.
6. Incidence in army group—age, sex, community, race, etc., entirely dependent on two forces: (a) Degree of exposure, (b) acquired immunity.

#### INCUBATION PERIOD

Orr (3) in a survey of an army epidemic demonstrated a distinct eighteen day periodicity of cases for six periods, as evidence of an eighteen day incubation period. Wesselhoft (4), in a summary of a large number of incubation periods collected from the literature, and in a

series observed by himself, determined the average period to be 18 days, with extremes of 8 and 30 days, his own extremes being 17 and 20 days. The extremes 8 and 30 when reports containing them are studied, are not convincing and convey a suspicion of error of observation. The usual extremes may be considered as 14 to 25 days.

On experimental infection of cats Wollstein found an incubation period of 5 to 8 days. Nicolle and Conseil experimentally produced the disease in monkeys with an incubation period of 16 to 27 days.

#### ANIMAL SUSCEPTIBILITY

By reason of the limited amount of experimental research done, and in the undertermined stage of a tangible mumps virus or experimental contagion with which to work, the degree of virulence to the common experimental animals has not been thoroughly determined. Wollstein chose young cats for her experimental inoculations, Granato chose rabbits, Nicolle and Conseil used monkeys. Gordon (15) in experimental infection of monkeys noted that *M. Cynomolgi* is more susceptible than *M. Rhesus*, for he infected 60 per cent of former and only 40 per cent of latter by intracerebral inoculation.

An occasional indefinite reference is found to natural infection of the dog and horse. There is no evidence incriminating any animal either as a reservoir of infection or as intermediate host.

#### METHOD OF CONTAGION

Direct and intimate contact is the usual means of contagion, the nasal, buccal and oral secretions having been shown to have greatest infectivity. The viability of these secretions on fomites has not been determined, but evidence favors their rapid loss of infectivity. Undoubtedly interchange of gum and candy in children and of pipes in men would transmit as readily as would direct contact, kissing or droplet infection. There is found no indication of intermediate host nor of carrier state. Prevention of direct contact is sufficient to limit this disease. Contagiousness is considerably less than that of the exanthema, and with this slight contagiousness, the absence of carriers, fomites and intermediate host, epidemics of mumps are localized, and, theoretically, readily controllable if all cases are recognized early enough to prevent dispersion by direct contact to associates.

The viability and duration of infectivity of the virus is an unknown factor. The general opinion prevails that a case is infectious before symptoms appear (prodromal infectivity placed by some at four days) during the height of the disease and even into convalescence. Wollstein (9*b*) noted that the virus was most readily detected in saliva during the

first three days of disease, less readily on the sixth day, and not at all after the ninth day. Further experimental research along lines opened up by the preliminary studies is needed to determine, for application in control measures, the duration of infectivity of mumps cases.

By reason of long incubation period and relatively low contagiousness, epidemics of mumps are slow of development and of several months' extent. Orr (3), in an analysis of progress of an epidemic, noted, in its duration of several months, the incubation period referred into a well-marked eighteen-day periodicity of recurrence, this being evidenced in six successive periods.

#### IMMUNITY

Varying opinions are expressed in the literature as to immunity conferred by an attack of mumps, the prevailing opinion being that an attack confers a lasting relative immunity, occasionally broken down by a second or a third attack. Radin (5) in 5,756 cases found 47 with history of previous attack—.8 per cent. Nicolle and Conseil (8) in a single experimental monkey infection and Wollstein (9) in experimental cat infection noted that an immunity against reinfection was acquired.

Hess(6) proposes that, in the presence of an epidemic in institutions, a passive immunity be conferred to contacts by intramuscular inoculation of 6 to 8 c.c. of whole blood freshly taken from mumps cases and convalescents; he reports twenty such inoculations of contacts in the presence of an epidemic, with no subsequent infection of those inoculated.

Gradwohl(7) in the use of convalescent serums in treatment of cases reported a marked reduction in symptoms and complications, the pain and fever promptly abating.

#### BACTERIOLOGY

Mumps as a bacteriological study appears to have received the least attention of any of the microbial infections probably because its usual self-limiting prevalence and low virulence have never given the disease significance except during the epidemics of war time when research must be at a minimum. As a result of this lack of attention, little convincing information is at present known of the causative agent and of infectivity.

Bacteriological observations that have been made have been of two types: (1) Those reporting inconclusive evidence of an associated diplococcus, and (2) experimental reproduction in animals by sterile filtrates, for demonstration of filter passing virus.

Captain and Charrin(10) in 1881 were probably the first to suggest the association of a microbe with mumps, which they obtained from blood and saliva, less often from urine, most abundant at height of

fever, diminishing at convalescence, and described as usually spherical, sometimes elongated rods. Inoculations were negative.

Laveran and Catrin (11) in 1893 obtained 67 times in 92 attempts, by puncture of parotid, testes, oedematous tissue, mumps arthritis and blood, a gram negative diplococcus in pure culture, growing on ordinary media, staining readily, but with unconvincing animal inoculations.

Numerous other authors have reported a similar diplococcus (gram positive reported by some) isolated from Stenson's duct, febrile blood culture and gland exudate, but animal experimentations have been invariably negative or inconclusive.

More recently Herb (12) reported finding a gram positive diplococcus in autopsy specimens following death from suppurative parotitis and broncho-pneumonia, and with cultures of which she reproduced non-suppurative parotitis by injections into Stenson's duct of monkeys and dogs. Haden (13) reported finding a gram positive coccus in five cases, from blood, special fluid and lymph gland.

These and other similar reports are quite inconclusive and probably are based on contaminations or isolations from suppurative processes, and it may be stated that no visible microorganism has been demonstrated as the presumptive cause of mumps.

The more recent work on the subject has a better claim for consideration and, while not complete or conclusive in results, is more convincing as a promising lead into future research.

Granata (14) in 1908 used mumps' saliva filtrate for animal inoculations, with results suggesting that the virus might be filterable. Nicolle and Conseil (8) in 1913 aspirated from active mumps parotid fluid which, after deciding that it contained no visible microorganism, they injected into parotid glands of three monkeys. After incubations of 16, 26 and 27 days these monkeys showed symptoms of infection, manifested by fever, with or without general symptoms lasting four to seven days. One monkey showed parotitis. One of these monkeys later reinoculated showed no signs of infection (acquired immunity).

Gordon (15) inoculated (intra-cerebral) ten monkeys with Berkefeld filtrate of mumps' mouth washings: four died with symptoms suggesting meningeal irritation in about fifty days; one spinal fluid examined before death was turbid, cells 1,500, of which 82 per cent were lymphocytes; culture sterile. These four dead monkeys showed microscopically an infiltration of pia-arachnoid with lymphocytes and degenerative changes in nerve cells of cortex cerebri and anterior horn cells of spinal cord; in three cases the parotid was negative, and in one case (which survived longest) there was an acute interstitial parotitis with foci of lymphocytic infiltration. The filtrate used was heated to 55° C. and



injected into a monkey which remained unaffected, though the same material unheated caused the monkey's death on the fifth day. He concludes that mumps virus, present in saliva, passed through Berkefeld filter, is capable of producing in monkeys, by intra-cerebral injection, a lymphocytic meningitis; that though virulence is low the virus is occasionally capable of producing fatal results, that if the monkey lives long enough acute interstitial parotitis will later develop, and that virus is destroyed at 55° C.

Wollstein (9) in 1916 infected young cats with filtered virus obtained by passing through Berkefeld candle, mouth washings from active mumps cases, the clear filtrate being tested and found to be sterile aerobically and anaerobically. One c.c. of this virus was inoculated into parotids and testes; control cats were similarly inoculated with emulsions from normal gland. After six to seven days there appeared (except in control cats) tenderness and swelling of testes and parotids, and some increase of temperature; all symptoms disappeared in the third week. Testicular atrophy was noted as sequel in several cats. Histologically the parotid gland showed oedema of interlobular connective tissue, mononuclear interstitial infiltration about ducts; grossly it showed congestion and oedema. Control cats showed slight temperature on the second day, lasting two days; none later, no tumor or tenderness.

This mumps virus was reinoculated into cats for seven generations, the author noting increased virulence at the third and fourth generations, decreased after the sixth, and becoming extinct at the eighth generation. Cats were reinoculated after recovery from this attack and showed no evidence of reinfection (acquired immunity).

In 1918 she summarized (9b) her findings thus:

1. Cats injected into parotid and testes with bacteriologically sterile filtrate of mumps saliva develop a pathological condition resembling the condition of mumps.

2. Incubation period in cats is five to eight days.

3. A rise of temperature and leucocytosis precede glandular swelling, are all maximums at the same time, and normal condition is reestablished in about four weeks.

4. Intra-parotid and intra-testicular injection of extracts of normal parotid and testes sometimes caused mild rise of temperature and brief leucocytosis, but swelling and tenderness were absent, while cell increase was polynuclear, not lymphocytic.

5. Saliva of man and inoculated cats, and inoculated glands were found to contain filterable infective agent.

6. Virus is most readily detected in saliva during the third day of

disease, less readily on the sixth day, and not at all after the ninth day. Virus was detected in blood of patients showing marked constitutional symptoms; and in saliva of a case of recurrent mumps at periods of enlargement of the parotid, but not two weeks after the swelling had subsided. It was not detected in the cerebrospinal fluid.

7. Serum of recovered cats exposed to virus at 37° for two hours resulted in loss of virulence of this virus, an evidence of immune bodies in blood serum.

More recently(9c) she extends her study into the meningitis and meningo-encephalitis sometimes accompanying mumps. Four strains of virus first used gave negative results in ten cats inoculated intrathecally. An active virus was obtained from mouth washings of four children on the second and third days of typical parotitis, and .1 c.c. of the sterile filtrate was injected into the subarachnoid space of each of two young cats. One cat showed symptoms on the second to the fourth day—turbid cerebrospinal fluid, positive globulin, cellular increase, no bacteria, slight strabismus; recovery on the fifth day. The other cat was killed on the third day, autopsy showed pia cloudy, oedematous, no exudate, and culture negative. A third cat was injected, to transmit virus to second generation, with .5 c.c. of the slightly turbid fluid from second cat, into cisterna magna, showing on the second and third days turbid fluid, cell increase and temperature. Controls were inoculated to show that the injection of albuminous material alone would not give a similar picture. She concludes "aseptic meningitis of three to five days' duration, of favorable prognosis, can be induced in cats by intrathecal injection of sterile saliva filtrate from early cases of parotitis, and such can be transmitted to other cats by injecting cerebrospinal fluid in same manner; cerebrospinal fluid does not contain bacteria that grow with ordinary culture methods."

Cultivation of this virus after the manner used for the other filter passing viruses has not been the subject of any reports available in the literature.

#### DIAGNOSIS

A consideration of the symptomatology and diagnosis, while not strictly pertaining to an epidemiological study, commands attention from two aspects: (1) to what extent is unrecognized mumps a nidus of spread of contagion, and (2) in what direction does the clinical aspect direct the attention of the observer searching for the etiological agent and the unknown properties of the virus.

Mumps may be considered as a general disease and, assuming the salivary gland involvement to be the primary focus (which it may not

be) the virus early metastasizes throughout the blood stream as a general infection, provoking diffuse and varying metastatic involvements, the extent, severity and frequency of which will become more manifest when more becomes known of the causative virus.

Hippocrates noted the orchitis and fever accompanying parotitis. Many other manifestations have been noted—to a great extent in proportion to the clinical acuteness of the observer, for in a mild infection many of these involvements pass unnoticed and attention is directed only to the more manifest evidence, the parotitis. Nor are there specific diagnostic methods at present available to aid in recognition of the extra parotid involvement when unaccompanied by the parotitis as an index of the true nature.

Focal evidences of mumps have been reported in the following locations, classified, for convenience of reference, into groups in approximate order of frequency of involvement.

1. *Glands: Parotid, submaxillary, sublingual, pancreas, mammary, and lachrymal.*—Radin(5) in a careful study of an epidemic at Camp Wheeler in 1918, found the following frequency of involvement of the various salivary glands in 4,279 cases studied:

<i>Gland</i>	<i>Total involved</i>	<i>Alone involved</i>
Parotid..... 4,243	(99%) Bilateral, 69% Right 14% Left 16%	3,928 (92%)
Submaxillary..... 440	(10%)	34 ( 8%)
Sublingual..... 30	(.7%)	2 (.05%)
Mixed gland infection in 333 (7%).		
All six glands involved in 10 cases.		

Pancreatitis is reported in widely varying proportions, as might be expected, that reported being usually moderate and not such as would be noted by the casual observer. An incidence as high as 16 per cent has been reported. Only 26 cases were placed on record in the U. S. Army during the World War.

2. *Genito-urinary Tract: Orchitis, Epididymitis, Ovaritis, Nephritis, Prostatitis.*—Of these orchitis is by far the most frequent to occur, and may at times be the only lesion of mumps manifest. It usually begins when parotid swelling begins to subside, but it may antedate parotitis or other symptoms. It seldom occurs before the age of puberty, but incidence in age groups after puberty is reported as high as 37 per cent, 20 per cent being about the average reported. In the U. S. Army during the World War, of 221,060 mumps placed on record, there were 24,330 reported with orchitis, a case rate of 11 per cent. Epididymitis was reported in 817 cases, or .37 per cent. Radin recorded the following

incidence of orchitis and epididymitis, noting their occurrence on the third to the sixth day, and lasting five to ten days.

		<i>Per cent</i>
Cases considered	4,397	
Testicular involvement	610	14
Orchitis	594	13.5
Bilateral	102	2.3
Right	231	5.2
Left	221	5
Epididymitis	5	11
Epididymo-orchitis	12	.27

3. *Nervous System: Meningitis, Meningo-encephalitis*(16) and *Lesions of cranial and peripheral nerves*.—This group has received considerably more attention in the last few years and its further consideration and study may furnish valuable information as to the nature of the virus. The reports now available indicate that slight cerebral and meningeal symptoms frequently occur but true meningitis rarely; that marked symptoms of a transient nature occasionally occur, and that there is usually complete recovery. Feiling(17) cites a case of fatal mumps, autopsy demonstrating a serous meningitis. Numerous authors have found spinal fluid in this involvement to be clear and showing a lymphocytosis, spinal puncture distinguishing it from epidemic meningitis, and the rapid onset from tubercular meningitis. Clinical observations therefore indicate that the virus of mumps attacks the meninges and probably the brain itself. Acker(18) observed that many of these cases pass unnoticed and reported 158 cases of meningitis among 1,705 cases of mumps, a case rate of 9.3 per cent.

4. *Special Senses*.—The ear complications probably furnish the most serious aspect of mumps infection. Hubbard(19) estimates that of the 50,000 deaf mutes in the U. S., 2,000 owe their condition to the non-suppurative involvement of the labyrinth in the course of mumps, which he and other authors estimate cause 3.5 per cent of deafmutism. No reference is found in army statistics to this complication. Otitis media in the Army occurred in 0.41 per cent of mumps cases (Table IV).

5. *Respiratory System*.—Involvement of this tract, while hypothetical and not established, is a subject on which future study of the offending virus may establish a claim. Probably a well-defined pathology of throat, nose and lungs will in the future be defined. The rates of involvement reported in Table IV give no guiding information, inasmuch as these conditions were probably incidental conditions.

6. *Miscellaneous Involvements*.—Fever was noted by Radin in 80 per cent of his cases, of one to twenty-four days' duration, with average of four days, and as high as 106° without other obvious cause. Occasionally there is reported involvement of other structures presumably

ascribable to mumps: virus-joint swelling, endocarditis, pericarditis, optic atrophy, and involvement of the thymus and thyroid.

TABLE IV.—DISEASES COMPLICATING MUMPS, IN U. S. ARMY, APRIL, 1917, TO DECEMBER, 1919

Complicating disease	Cases	Per cent
Ochitis	24,350	11
Epididymitis—non-venereal	817	37
Pancreatitis	26	012
Meningitis—simple	24	011
Tonsillitis—acute	1,595	72
Bronchitis	1,223	55
Otitis Media	906	41
Pneumonia—Lobar	701	32
Pneumonia—Broncho	320	14
Conjunctivitis	248	11
Pharyngitis—acute catarrhal	274	12
Arthritis	184	08
Mastoiditis	111	05
Sinusitis	93	04
Myocarditis and myocardial insufficiency	92	04
Laryngitis—acute catarrhal	80	036
Rhinitis	62	03
Muscular rheumatism	52	024
Tachycardia	63	03
Neuro-circulatory asthenia	38	017
Meningitis—cerebro-spinal	35	016
Nephritis—acute	27	012
Hydrocele	23	01
Psychoneurosis	22	01
Neuralgia	21	01
Exophthalmic goitre	26	012
Herpes	21	01
Septicæmia	6	003
Others		
Total	17,008	18.1

7. *Blood Picture.*—Feiling (17) summarizes the blood findings in mumps:

- (a) Slight total increase in leucocytes.
  - (b) Lymphocytosis relative and absolute, present first day persists at least fourteen days.
  - (c) Orchitis does not invariably alter blood picture.
- This lymphocytosis in parotitis is uniformly reported by other authors; most authors ascribe a polymorphonuclear increase to the orchitis.

The following diagnostic signs aid in differentiation of mumps:

1. Parotid tumor of characteristic consistency.
2. Orifices of Stenson's duct pour as a bright red papilla and may gape wide open.

3. On passing finger from the chin around the ramus of the inferior maxilla, there is a distinct evidence of tenderness just before the angle of the jaw is reached. This is present before any apparent swelling (20) and is as diagnostic as Koplik's spots in measles (5).

4. Spinal fluid: Negative in simple mumps, lymphocytosis in mumps-meningitis.

5. Blood: lymphocytosis with parotitis changing to polynuclear increase when orchitis intervenes.

#### MORTALITY

Feiling (17) reported the death rate in England and Wales in years 1891-1910 to be three per million (annual). The mortality in the U. S. Army in the World War accredited to mumps as the original diagnosis was 181 (Table V); but these deaths were associated in every case with a secondary diagnosis, which requires consideration in at least partially acquitting mumps of responsibility.

TABLE V.—DEATHS ACCREDITED TO MUMPS, U. S. ARMY, APRIL, 1917, TO DECEMBER, 1919

Associated disease	Cases	Deaths	Case fatality rate	Case fatality of associated disease only
			<i>Per cent</i>	<i>Per cent</i>
Pneumonia—lobar.....	701	60	8.6	21.8
Pneumonia, broncho.....	320	28	8.7	27.9
Pleurisy, suppurative.....	85	22	25.9	11
Meningitis, cerebrospinal.....	35	10	28.6	37.7
Meningitis, simple.....	24	9	37.4	46.1
Nephritis, chronic.....	24	6	25	7.8
Tuberculosis, pulmonary.....	153	6	3.9	6.9
Nephritis, acute.....	27	5	18.5	5.7
Septicemia, general.....	6	3	50	46
Intestinal obstruction.....	7	2	28.6	11.2
Orchitis.....	24,330	5	.02	.....
Tonsillitis, acute.....	1,595	4	.25	.09
Sinusitis.....	93	4	4.3	4
Influenza.....	551	3	.54	3.18
Syphilis.....	310	3	.97	.21
Bronchitis.....	1,223	3	.25	.17
Scarlet fever.....	288	2	.69	3
Myocarditis and myo. insufficiency.....	92	2	2.2	2.2
Measles.....	436	1	.2	2.5
Pancreatitis.....	26	1	3.8	42.9
Meningococcus carrier.....	73	1	1.37	0
Total.....	30,399	181	.....	.....

#### METHODS OF CONTROL

In considering the control of mumps infection the following observations, already mentioned, require consideration:

1. Incubation period averages 18 days; usual limits 14 to 21, occasionally up to 25 days.
2. Contagion is by direct and intimate contact; presumably a sputum-borne disease.
3. Carriers and intermediate hosts do not require consideration.
4. All ages are susceptible. Sexes equally attacked.
5. One attack confers relative, not absolute, immunity.
6. Rural population is more susceptible because of non-immunity.
7. Colored population is more susceptible in proportion to rurality.
8. Epidemic maximums may be expected in late winter and early spring months, and minimum in summer and fall months.
9. Early diagnosis and segregation of new cases is most important.
10. Recognition of extra parotid manifestations, in that unrecognized focus of infection be not permitted.
11. Bacteriology unknown; is probably a filterable virus present in sputum just before and during parotid manifestations.
12. Period of infectivity unknown, but case considered to be infective from two days prior to parotitis (in prodromal stage) to recession of gland signs.

Mumps has been made a reportable disease by the following states:

Alabama, Alaska, California, Colorado, Delaware, Illinois, Iowa, Kansas, Maine, Maryland, Massachusetts, Michigan, Nevada, New York, Ohio, Pennsylvania, Porto Rico, South Carolina, Vermont, Wisconsin.

The sanitary code of the State of New York (quoted as a type), after classifying mumps among the communicable diseases, regulates: Physicians or superintendent of hospitals or other institutions report cases within twenty-four hours to local health officer. Teacher in schools, proprietors in hotels, etc., report presumptive cases and exclude children from school. Vessel master reports any presumptive cases on ship-board. Physician is held responsible that isolation is effected as soon as case is recognized. Adult contacts are not required to be quarantined. No placard is prescribed. Child inmate of household having case within fifteen days is excluded from school and gatherings of children. Maximum period of incubation is considered to be twenty-one days. Minimum period of isolation until two weeks after disappearance of disease and one week after disappearance of the swelling.

The forthcoming issue of Army Regulations covering the control of communicable diseases will provide for the control of mumps as follows:

Detention camps for the troops: to be established at all stations for incoming recruits, detaining all recruits under working quarantine for sufficient period of time to detect the presence of acute communicable

diseases and limit its introduction into the general command. They will be carefully inspected by medical officer at least once a day. Minimum period of detention two weeks. In case few recruits join at infrequent intervals they may be assigned directly to organizations provided that they report daily to the surgeon of the organization for at least two weeks.

"When mumps appears in a military organization the group-control measures will be put into effect. Quarantine measures under service conditions have been found to be futile and reliance will be placed in physical inspections for the detection and hospitalization of cases in the prodromal stages and of suspects."

The group control measures—for sputum-borne diseases—are as follows:

Physical examination and segregation of cases and suspects—to insure the immediate removal of incipient cases and suspects the following general provision will be carried out:

Upon the appearance of the first recognized case, the command, or such part thereof (ordinarily contact) as the surgeon may recommend, will be inspected at least daily, and during the presence of an epidemic inspection will be made twice daily. Special attention will be directed to the recognition and hospitalization of cases in the earliest stages of illness and to the segregation of suspects. . . .

Control of healthy contacts.—The measures to be instituted for handling healthy individuals who are exposed to diseases of this group will depend on the prevailing disease and on susceptibility or nonsusceptibility of the individual. For some diseases an absolute quarantine may be necessary, for others a working quarantine will suffice, and for still others physical inspection at daily or other stated intervals with a view to detecting incipient cases and suspects will fulfill necessary requirements. . . .

#### CONCLUSION

Mumps incidence was exceeded in the late war only by that of influenza, these being two of the few diseases having higher rates in this than in other wars. It is a serious military disease by reason of its sick wastage. There is need of research giving information on infecting agent, pathology, extraparotid involvements, diagnosis of extra-parotid types and of duration of infectivity.

It is probably along the line of filter-passing experimentation that this study will reach its goal, being linked with the research study of rabies, poliomyelitis and encephalitis lethargica.



BIBLIOGRAPHY

- (1) HAYDEN EMERSON: "General survey of Communicable Diseases in the A. E. F." MILITARY SURGEON, October, 1921.
- (2) Annual Reports of the Surgeon General, U. S. Army
- (3) ORR: "On the Incubation Period of Mumps." Jour. Royal Army Med. Cor., 1918, xxxi, 480.
- (4) Wesselhoeft: "Mumps." MILITARY SURGEON, 1920, xlv, 63.
- (5) RADIN: "The Epidemic of Mumps at Camp Wheeler." Archives of Int. Med., 1918, xvii, 354.
- (6) HESS: "A Protective Therapy for Mumps." Am. Jr. Dis. of Children, 1915, x, 99.
- (7) GRADWOHL: "Study of an Epidemic of Mumps." U. S. Naval Med. Bul., 1919, xiii, 723.
- (8) NICOLLE et CONSEIL: "Reproduction experimentale des oreillons chez le singe." Compt. rend. Soc. de Biol., 1913, lxxv, 217.
- (9) WOLLSTEIN:
- (a) "An Experimental Study of Parotitis." Jr. Exp. Med., 1916, xxiii, 353.
- (b) "An Experimental Study of Mumps." Jr. Am. Med. Assn., 1918, lxxi, 639.
- (c) "Experimental Mumps-Meningitis." Jr. Exp. Med., December 1, 1921.
- (10) CAPTAIN et CHARRIN:
- (a) "Etiologie des Oreillons." Compt. Rendu des Seances de la Societe de Biologie, 28 Mai, 1881.
- (b) "Microbes dans les Oreillons." *Ibid.*, 3 Dec., 1881.
- (11) LAVERAN et CATRIN:
- (a) "Sur un diplocoque trouve chez les malades atteints d'oreillons." Compt. rend. seances et mem. de la Soc. de Biol., 28 Jan., 1893.
- (b) "Recherches Bacteriologiques sur les Oreillons." *Ibid.*, 20 Mai, 1893.
- (12) HERB: "Experimental Parotitis." Arch. Int. Med., 1909, iv, 201.
- (13) HADEN: "The Bacteriology of Mumps." Am. Jr. Med. Soc., 1919, elviii, 698.
- (14) GRANATA: "Sulla etiologia degli orece hioni da virus filtrabile." Soc. Med. Ital., 1908, vi, 647, 672.
- (15) GORDON: "Experimental Investigation in Relation to Mumps." Report to Local Gov. Bd. on Pub. Health, London. New series No. 96, 1914.
- (16) HOWARD: "Meningo Encephalitis as the Only Manifestation of Mumps." Am. Jr. Med. Sc., 1919, elviii, 685.
- (17) FEILING: "Mumps: a Critical Review." Quart. Jr. of Med., 1915, viii, 255.
- (18) ACKER: "Parotitis Complicated with Meningitis." Am. Jr. Dis. Children, 1913, vi, 399.
- (19) HUBBARD: "Nerve Deafness and Mumps." Trans. of Am. Otological Soc., 1915, 451.
- (20) SAILOR: "Mumps." Med. Clinics of N. America, 1919-20, iii, 1,423.



## DAILY PHYSICAL EXERCISE A FACTOR IN PREVENTIVE MEDICINE

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*Mass Athletics versus Competitive Athletics.*—Competitive athletics are sports par excellence for gaining an *esprit de corps* for military stations and colleges and if under daily supervision of an experienced medical officer very little harm will result, but from the standpoint of physical exercise, the very ones who need the exercise most are unable to make the team. One should not engage in competitive athletics for exercise alone. The training is intense, and invariably comes the slump after the season is over, and in many cases the men are in as bad if not worse condition than before. Moderation in daily physical exercise should be the aim. Moderation in competitive athletics is not possible.

Competitive athletics should be encouraged because it typifies a progressive race. It fosters sportsmanship, a much needed element in any country. An experienced medical officer, however, should be consulted in the choice of the athletes and given authority of daily medical supervision.

Mass athletics, although for each individual, will not be a success unless compulsory. It has been my experience, as an athletic officer, that the men in good condition take daily physical exercise on their own initiative, while men in poor physical condition lack the energy to take part unless ordered or urged to do so.

*Choice of Athletics.*—Setting-up exercises are too formal and lack the zest found in games. We have found that the exercises valuable to the aviator will be found in volley ball, tennis, equitation, swimming or golf. Volley ball is gaining in popularity and has the advantage of being simple and that any number of men can play. As an exercise for neuro-muscular coordination, so necessary to the flier, volley ball is unsurpassed. The command to perform the various movements in the setting-up exercises is called by a leader. All the movements of the setting-up exercises and many more are made by a volley ball player in a close contest. The command for these movements originates in the brain of the player and the decision and performance are carried on with lightning-like rapidity. Tennis is a good form of exercise but requires a great deal of skill, and unless matched evenly the players lose their enthusiasm. Swimming and equitation are great outdoor sports and good exercise; due to the self-confidence and well being they impart, every one should become proficient. Golf is good, conservative

exercise but should be alternated with a game of more active movements such as volley ball, tennis or swimming. A daily brisk walk of fifteen or twenty minutes will do more toward physical efficiency than one-half day a week of golf.

*Physical Fitness.*—A good physical condition contributes to mental alertness, good health and high morale. A poor physical condition is conducive to morbid thoughts, petty ailments and low morale. Whether a bookkeeper or an aviator, physical fitness will be found a factor both in his general efficiency and in his health.

Physically a man is either in poor condition, fair condition, good condition or hard condition. A man in poor condition is easily exhausted by mental or physical exertion, is irritable, has a sallow complexion, dull eyes, and usually complains of constipation and headache, and sometimes nervousness and insomnia. A man in fair condition strikes a medium between good and poor. A good condition is evidenced by a good physical bearing, an elastic step, bright eyes and a healthy complexion, and is not easily fatigued—in other words, physically fit for the mental and physical clashes of everyday life. Hard condition is that physical condition built up by a rigid system of training, physically fit for competitive athletics but overtrained for the ordinary routine of life.

*An Experiment at Bolling Field.*—Last May the majority of the fliers were found to be in poor physical condition. With the consent and encouragement of the commanding officer the hour from 11.30 to 12.30 was set aside for exercise. The exercise selected was volley ball. In one month's time there was a noted increase in their physical efficiency, a higher morale and less complaints from petty ailments. Since then the exercise has been continued by order of the commanding officer.

The table below will show the result as tested by Schneider's Index (in this article only the total scores will be given). The index was taken once a month from May to February, between the hours 9.00 a.m. and 11.00 a.m. The fliers were not told the day they were to be tested, nor were their habits controlled after 4.00 p.m.

Schneider<sup>1</sup> grades on reclining pulse, standing pulse and the increase from reclining to standing, increase after exercise, time of return of pulse to normal and difference in reclining and standing systolic blood pressure. For use by flight surgeons I have made the following arbitrary divisions:

#### INDEX

Very good, 17 or 18	Fair, 8 to 13
Good, 14 to 16	Poor, 7 or less

<sup>1</sup>Schneider, F. C.: "A Cardiovascular Rating as a Measure of Physical Fatigue and Efficiency." J. A. M. A., 74:1507, May 29, 1920.

Before daily exercise				One hour daily exercise			
No.	Name	Index May 1921	Index June 1921	Index July 1921	Index August 1921	Index Dec. 1921	Index Jan. 1922
1	H. Z. B.	17	17	17	18	18	16
2	W. B.	16	17	15	17	16	17
3	A. B.	8	11	12	15	7	14
4	R. H.	4	15	2	8	10	14
5	R. A. D.	.....	14	15	10	.....	14
6	M. K. R.	11	7	.....	15	.....	14
7	M. S.	11	.....	14	.....	16	16
8	T. S.	12	17	17	16	17	17
9	T. S. V.	13	15	14	14	14	15
10	P. W.	5	17	16	15	15	16
11	L. W.	9	14	15	.....	15	16
Average		10.6	14.4	13.7	14.2	14.2	15.4

The table shows a decided increase in the averages after compulsory exercise. There is no steady increase from month to month, nor was it expected where fatigue effects of cross country flights, loss of sleep and excesses were factors to be considered,<sup>2</sup> but it is significant that in spite of these things, physical exercise kept the averages for the unit on a higher plane. Nos. 1 and 2 were not affected by the exercise because of the nature of their work. One is a utility and the other an engineering officer. They work in the open day after day and admit they seldom get less than eight hours' sleep at night. No. 3 progressed until December, and in taking the usual history he complained of a headache and said his bowels had not moved for three days. No. 4 in July gives history of very little exercise due to other duties, complains of a headache and constipation and six hours' sleep. No. 6 in June returned the day before from Boston where he flew thirty-five hours in one week making aerial photographs of the city.

From the table we gain the following:

<i>Before daily exercise, per cent</i>		<i>After daily exercise, per cent</i>
Very good 17-18 ..	1 or 10	4 or 40
Good 14-16 ..	1 or 10	4 or 40
Fair 8-13 ..	6 or 60	1 or 10
Poor 7 or less ..	2 or 20	1 or 10

<sup>2</sup>Scott, Verner T.: "The Application of Certain Physical Efficiency Tests." J. A. M. A., March 12, 1921, Vol. 76, pages 705-77.

It is obvious that the hour spent in physical exercise is worth while and compensates for the time taken up when a group of men who are rated physically as 60 per cent fair and 20 per cent poor can be classed a month later as 80 per cent good and very good.

*Conclusions.* Although physical exercise is the main factor in physical fitness, it will not alone keep a man in good physical condition. Other factors to be considered are loss of sleep, constipation, excesses and fatigue effects of cross country flights. One hour a day compulsory mass athletics will keep a group of men in a higher state of physical efficiency, increase the morale, and lessen the complaints from petty ailments. Setting-up exercises are dull and in no way can be compared to a game as a form of exercise. Everything else being equal, one hour a day physical exercise with eight hours' sleep and one good bowel movement a day will keep any flier fit for any flying duty he is called upon to perform.

[I am indebted to Pvt. E. Barr, Medical Department, for assistance in making the tests.]

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## The Henry S. Wellcome Prizes

Competition open to all medical officers and former medical officers of the Army, Navy, Public Health Service, Organized Militia, U. S. Volunteers, and of the Reserves of the United States:

**PRIZE FIRST: A GOLD MEDAL AND \$300**

**PRIZE SECOND: A SILVER MEDAL AND \$200**

Competition for 1922 will be based on essays on prescribed subjects, as follows:

**First Prize.** "A Plan for the Correlation of the Three Federal Medical Services in Preparation for War, During the Continuance of Hostilities and Through the Subsequent Period of Reconstruction.

**Second Prize.** "Influences of the World War on the Development of Civil Practice."

Each competitor must furnish five copies of his competitive essay. Essays must not be signed with the true name of the writer, but are to be identified by a *nom de plume* or distinctive device. They must be forwarded to the Secretary of the Association of Military Surgeons of the United States, Army Medical Museum, Washington, D. C., so as to arrive at a date not later than **September 15, 1922**, and be accompanied by a sealed envelope marked on the outside with the fictitious name or device assumed by the writer and enclosing his true name, title and address. Essays must contain not less than 5,000 nor more than 20,000 words, exclusive of tables. The envelopes accompanying the winning essays will be opened at the annual, or other meeting, by the president, and the names of the successful contestants announced by him. The winning essays become the property of the Association and will be published in **THE MILITARY SURGEON**. The writers of the essays receiving "first honorable mention" will be awarded life membership in The Association of Military Surgeons, U. S.

# THE ANTI-BOLSHEVIK CRIMEAN ARMY OF DENIKIN AND WRANGEL—SANITARY DEPARTMENT

By LIEUT. COLONEL CLYDE S. FORD

*United States Army, Retired*

( With three illustrations )

## GENERAL HISTORY<sup>1</sup>

AN ACCOUNT of the adventures of the Crimean Army since it came into being, following the great war armistice in the fall of 1918 might be written under any caption ranging from "A Hard Luck Story" to "A Tale of Wretchedness and Woe."

For a better understanding of the vicissitudes of the Sanitary Department the different periods and development of the Crimean campaign may be reviewed.

The German occupation of the Ukraine and the Crimea, immediately following the Bolshevik revolution, drove out of the Crimea the Bolshevik regime locally initiated by the revolution of the Black Sea fleet in Sevastopol in November, 1917, and established a local dummy Tartar government under German direction and domination. After the withdrawal of the Germans from the Crimea, following the armistice in November, 1918, and on the request of the local Tartar government, Denikin sent some troops of his Volunteer Army to the Crimea which soon occupied the entire peninsula and some of the territory to the north.

The Bolsheviks returned and drive the volunteer forces out of all this area except the southeastern extremity known as the Kertch Peninsula. At this time the front of the Crimean Army ran across the neck of this peninsula a little east of Theodosia, through a small village known as Atkmani which gives its name to this line of defense. Here this little force of the Volunteer Army made a desperate resistance to the Bolshevik pressure until June, 1919, when it advanced with a success that carried the front far north of the Crimea to form a part of the line of advance of the victorious Volunteer Army throughout the summer and fall of 1919. Then in January, 1920, when the front of the defeated retiring Volunteer Army was pierced in three places and divided into three groups, the center group retired to the Crimea and took position of defense on the neck of the peninsula. This group was principally composed of the Third Corps of the Volunteer Army, which designation it retained, but it was also known after this as "The Crimean Army of Defense."

Shortly after this time, April 4, 1920, Denikin was succeeded by

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<sup>1</sup>See Section—"A Story of the Crimea Since Revolution of March, 1917."

Wrangel as commander-in-chief of all that was left of the original Volunteer Army, which has been described since that time as "The Armed Forces of South Russia" and has occupied the entire Crimean Peninsula as a besieged fortress. With the administration of the new commander-in-chief began a reorganization and reform which has proceeded constantly and energetically with such remarkable results that within a period of about two months these beaten, demoralized, disorganized and discouraged fragments of the old Volunteer Army have been formed into four efficient corps which recently began a strong offensive and have succeeded in recovering from the enemy a larger extent of territory to the north on the mainland, than that of the entire Crimean Peninsula.

#### PERIODS OF EVENTS

The story of the Sanitary Department may be divided into four periods:

1. From November, 1918, when the Volunteer Army appeared in the Crimea, to June, 1919, when the Volunteer Army advanced again from its stronghold in the Kertch Peninsula.

2. From the advance of June, 1919, to February, 1920, when Odessa was evacuated the second time and General Schilling withdrew to Theodosia by sea and General Siaschhoff retired from the north to the Perekop and Chongar line of defense in the neck of the Crimean Peninsula.

3. From February, 1920, to the first of April, 1920, when General Wrangel became commander-in-chief.

4. From the first of April, 1920, throughout General Wrangel's period of reorganization and reconstruction, to the recent advance of June 7 to June 20, 1920.

*First Period.*—The first period is of little interest because it covers the time when a small force swept across the Crimea and was driven back again to the eastern extremity, on more or less of a personal initiative, without any central organization.

*Second Period.*—The second period has some bearing on subsequent events because it was during this time that a great number of ineffectives from the center group of the broken front of the Volunteer Army were concentrated in the Crimea.

*Third Period.*—The third period is the most tragic because it covers the time when the Crimean Army of Defense, as an organized body, suffered its greatest distress. The commander-in-chief of the Crimea (General Schilling) had his headquarters in Theodosia with the command of the Third Army Corps in the field under General Siaschhoff at Djankoi.

The administration of the Sanitary Department was, as a matter of course, associated with the commander-in-chief in Theodosia under the nominal direction of Dr. Weiss, a medical officer of the old Russian Imperial Army, as the "Field Medical Inspector." As a matter of fact, all the troops in the front area, as well as the rear extending back to Sevastopol, were under the command of General Sliaschhoff at Djankoi, and all the real activities that pertained to the army and the Sanitary Department were centered in this area, and had only a remote connection with Theodosia. There were four civil relief organizations—Red Cross, White Cross, the Zemstvo Union, and the Union of Cities—which conducted hospitals and other sanitary units and carried on a work more or less independently which otherwise would not have been done. The statistics and reports of this period are of little or no value, as the means of communication of the sanitary units were so uncertain and irregular that the central administration had little opportunity to perform its function. There was a shortage of everything that pertained to the care of the sick and wounded.

All classes of personnel—doctors, nurses, sanitary soldiers—were never sufficient in numbers to properly administer any of their units. Medical supplies were deficient in all classes. Beds, bedding, linen, clothing, soap and cleaning materials were so short in all military units and most of the civil society units that nothing like decent attention could be given to patients. The medical supplies available were not concentrated and distributed under any centrally supervised system of issue.

While all of the hospitals were waiting for surgical supplies, and especially dressings, there were one million yards of gauze safely guarded by an old fossilized supply officer in the naval hospital at Sevastopol. This fine old functionary, a type not peculiar to the Russian system of administration, was so proud of his cunning in hiding these stores from the Germans that he persisted in his policy of conservation and held onto them as personal trophies regardless of the indication for their issue.

The British Military Mission had furnished a large quantity of medical stores to the Volunteer Army in the Caucasus and had sent to the Crimea the full medical equipment of a British Army Corps, but there had been no systematic distribution of this material, so that the regimental field chests did not always reach their proper destination, as they were found in hospitals in the rear where they sometimes constituted most of the medical equipment. As there was no advance medical supply depot it was necessary for the Chief Surgeon of the Army Corps to send representatives of various units to supply centers to



secure the medical supplies. The American Red Cross was at this time furnishing no material for the Crimea, as the varying fortunes of the Crimean Army had led the society to fear that supplies, if furnished, would eventually fall into Bolshevik hands. (See special report: "Military Stores furnished to A. F. S. R. by British Mission," for medical supply items.)

#### HOSPITALS

There were several fairly good hospitals but none of them under military administration. There were one or two of the Red Cross and of the White Cross which could be considered as acceptable, under the circumstances, in which there was enough equipment, and especially linen, to permit keeping patients clean. In all the other hospitals the condition was appalling. They were dirty, lousy and buggy. It was more the rule than the exception that the patients were kept in bed throughout their illness in the same clothes in which they had been admitted.

In one hospital, where there was enough patients' clothing to use on surgical cases only, I have seen these patients brought to the operating room so covered with lice that they were soon crawling around on their clean clothing and on the operating table. In one of the better Red Cross hospitals I saw patients, some of them very ill with typhus fever or relapsing fever and complications, who had been in bed for a month or more without having their clothing changed while it bore all the superficial evidences of heavy lice infestation. To make all these bad matters worse there was often a shortage of water supply which furnished almost the last element of misfortune. In most of the hospitals in the larger cities the water supply was very irregular and generally deficient on account of the lack of fuel for pumping stations. Some hospitals were without water for several days and with only enough transportation to haul the water which was absolutely necessary for drinking and cooking. The medical personnel was confronted with so many real difficulties that they seemed to lose all heart and courage and accepted some of these unnecessary conditions as the ordinary and conventional thing.

During this period General Sliaschoff made an inspection of the hospitals in Sevastopol and published an order in which he criticized the Medical Department very severely and threatened courts-martial and executions unless some improvement followed, although he was unable to supply required material. The local administration of all the hospitals in Sevastopol was directed by a Medical Inspector of the Navy, who was also the commanding officer of the large naval hospital of that port. With this officer I made an inspection of all the hospitals

in Sevastopol during this period of their wretched and lousy condition, and two weeks later he was taken sick with typhus and shortly afterward died.

The greater number of admissions were due to typhus and relapsing fever, but it frequently happened that a case admitted for one of these diseases would be infected with the other before he could be discharged. It was quite ordinary, also, for surgical cases to become infected with either or both of these diseases after their hospital admission.

Besides the purely professional part of the hospital administration there were great economical difficulties with the subsistence problem and laundry work. The constantly falling value of the rouble always left the per diem allowance for subsistence of patients something below the actual market price of the ration, so that there was always a deficit in the subsistence accounts which cost the hospital administration a great deal of trouble and concern. There was not enough money allowance in any case to pay for the labor required to perform the laundry work, and it seemed impracticable to secure such service by military details.

#### CONVALESCENT COMPANIES

There was an administrative effort to return patients in hospital to duty through the organization of convalescent companies which were established in all of the large hospital areas.

These companies had a formal organization of 250 men with four of the companies grouped together, so that the strength of one of these units was intended to be 1,000. As a matter of fact there was never any relation in the actual state of the units to the table of organization.

Although these convalescent companies may be properly charged to the Sanitary Department as they resembled hospitals more than anything else—they were made up of the sick and wounded who were not completely cured or could not for other reasons be returned to duty—the administration was not medical but under the direction of line officers with a doctor attached. They were located in some building that was unsuited for anything else, and were provided with very little material beyond the bare ration and scantiest bedding.

These places were used as a dumping ground for hospital cases which were not acutely or gravely sick when it became necessary to provide space in so-called hospitals for newly admitted cases.

After the discharge from hospital and admission to convalescent companies, many patients became manifestly ill and remained without medical attention or were returned to the hospital. There was no clothing supply available for issue in these companies, and all inmates were short of clothing in some respect. Some of them were nearly naked and wore only fragments of underclothing. Others had blouses

and trousers with no underclothing or shoes. In many respects the convalescent companies were the most impossible and hopeless units connected with the Sanitary Service.

The conditions in these convalescent companies have improved greatly in the last few months on account of an increase in the supply of clothing and the reduction in hospital admissions for typhus and relapsing fever, so that fewer cases have been transferred from hospitals in an unfit condition.

On the whole, while the Sanitary Department has been in such a wretched condition on account of the distressing lack of all classes of material and the discouraging shortage of medical personnel, which made it physically and humanly impossible to produce anything like a satisfactory condition, much more might have been made out of this bad condition with more enterprise and industry on the part of the sanitary personnel.

*Fourth Period.*—The fourth period, beginning with General Wrangel's administration, is a continuation of the conditions of the third period, but marked by a substantial and progressive improvement in all branches of the Sanitary Department. Many of the inherent defects, such as the shortage of matériel and personnel and the lack of enterprise, initiative, energy and industry in local administration, still remain.

The Central Administration has been greatly improved by the following changes:

When General Denikin came to the Crimea in supreme command after the evacuation of the Caucasus (March 27, 1920) and relieved General Schilling as commander-in-chief in the Crimea, General Schilling's Field Sanitary Inspector, Dr. Weiss, was also relieved and Dr. Artemieff, who had been the chief surgeon of General Denikin's Army of the Caucasus, retained this same position on Denikin's staff in the Crimea. When General Wrangel succeeded General Denikin in the Crimea he retained Dr. Artemieff as the Chief of the Sanitary Department.

The headquarters of the Army were then moved from Theodosia to Sevastopol so that the office of the Field Sanitary Inspector was then placed in a geographical position which was much more favorable for communication with the troops in the field and with the base area as well. Dr. Artemieff died on May 25, 1920, from typhus fever contracted on a trip of inspection to the front.

The Chief Surgeon of General Sliaschhoff's Crimean Army of Defense (the old III Corps of the Volunteer Army), Dr. Loukachevitch, was appointed field medical inspector with the relative rank of brigadier general. He is a medical officer of the old Russian Army and had

served as the surgeon of a regiment of the Imperial Guards' Corps in Petrograd, and later as a corps surgeon in the Russian Army during the European War. He is well qualified professionally and is a man of strong personality, unbounded energy and fearless character. I saw him in the field at Jankoi in March, 1920, just after he had become chief surgeon of the III Corps. It was then he told me of the difficult sanitary conditions, with 80 per cent of his command sick during the winter months, and the situation at that time was not too greatly improved. He complained of the deficiencies of the sanitary personnel and of the scarcity and inefficiency, particularly of doctors, and the great and almost total shortage of medical supplies.

He was unable to leave corps headquarters, except on rare occasions, for lack of transportation and he had no assistant whom he could rely on as a sanitary inspector.

He expressed some impatience with the dreadful condition he found so difficult, if not impossible, to improve, and he announced that he was so "fed up with the whole show" that he would rather serve in a "Chinese army" than to be associated with such a mess.

If the South Russian Army can find the necessary economic support for the continuation of its campaign and if the necessary medical supplies can be procured, I am sure that the Sanitary Department will be greatly improved and will, at least, become as good, if not better than the army itself.

General Wrangel had known of the wretched condition of some of the sanitary organizations and ordered an inspection of one of the hospitals in Sevastopol about a week before Dr. Loukachevitch came into his office. The following General Order on this subject was published at G. Q. H. on May 17, 1920:

1. General Petroff, who by my order has inspected the United Sevastopol Hospital, located in the naval barracks, has reported as follows:

2. There are in all 279 patients lying on hard mattresses and pillows. Most of them are wearing old, dirty linen. Three of them have no hospital clothing at all, and some have no bed covers.

3. The temporary Chief Doctor (Dr. Dambosky) and the Chief of the Hospital Administration (Col. Affamassieff) said that there was no linen on hand, while at the same time I found in the store-room for linen and clothing the following:

500 suits of warm clothing.

800 pairs of socks.

143 light suits.

143 light cotton shirts and drawers.

Bed clothing, removed from beds of discharged patients, which had not been disinfected was found lying in a pile in a corner of the room.

4. The sick were dirty, as the baths were out of order. Discharged patients say that they are sent away from the hospital unbathed and without having their clothing disinfected. In this way they involuntarily spread disease. The disinfecting chamber is not operated because there is no sulphur.

5. There is but one thermometer in the hospital. Only black bread is supplied. The food served in the wards to the sick is not good and is not sufficient and is the same thing every day without any change or variety.

6. Such a state of disorder in a hospital cannot be tolerated. The Chief Military and Naval Prosecutor must immediately prepare charges and bring to judgment before a court-martial those who through laziness have neglected their duty and have failed properly to exercise their authority.

The result of the trial was the acquittal of the accused, who based their defense on the claim that the hospital was not supplied with the material and facilities necessary for keeping the patients clean; that food in kind, or money to purchase the commissary supplies, was not sufficient to provide a decent mess; that the personnel was deficient, incompetent and indolent and that they had no recourse to any disciplinary measures by which the personnel could be compelled to do the proper amount of work.

There were four hospitals in this large naval barrack compound, and it was well known that this particular hospital was not the worst. I was informed by medical officers of one of these other hospitals that the motives that brought about this trial were not wholly pure but that they were due to some personal differences and a desire to persecute the administrator of the hospital. It was explained that the clothing the inspector found in the store-room unused had just been received from the Supply Department or had been returned from the laundry the day before.

#### PRESENT CONDITION OF THE SANITARY DEPARTMENT

##### HOSPITALS

In all the hospitals I have seen lately an improvement in their condition has been manifest. The medical officer of the British Military Mission made an inspection of 28 hospitals between May 18 and June 5, and reported as follows:

None of the hospitals were overcrowded, and for the most part they were clean and the patients were generally fairly comfortable. The hospitals in which the patients were the best looked after were the White Cross hospital at Kertch and the White Cross surgical hospital at Simferopol, and those in which they were the least well looked after were the Evacuation Point, Theodosia, and No. 37 Field Reserve Hospital, Simferopol.

The most urgent hospital requirements are as follows:

(a) *Linen*.—With few exceptions there was a shortage of linen of all kinds, although the supply had been substantially increased in the last month by the contributions of the British Military Mission and the American Red Cross. At the same time there was nowhere enough material for a proper hospital service.

(b) *Cooking and Feeding Utensils*.—There was generally enough crude equipment of some kind to permit the preparation of food and its distribution to the wards in bulk, but there was a great shortage of all kinds of tableware. Spoons, plates, mugs and basins were especially in demand. Some enterprise and ingenuity had been employed in many places in supplying these deficiencies by making spoons out of wood, tin cups and basins out of old meat cans, and glasses by cutting off the tops of bottles. Nickel-plate cuspidors from the naval stores like those seen in Pullman cars, were modified and used as mess vessels.

(c) *Soap*.—Soap was in particularly great demand everywhere, and it was not possible to make any substitution for this shortage. The American Red Cross had furnished a good supply, but it was not nearly enough to meet the demand.

(d) *Slippers*.—The shortage of slippers was general and added very much to the difficulty of keeping bed patients clean.

(e) *Medical Supplies*.—The chief deficiencies in dispensaries were castor oil, salol, neo-salvarsan, thermometers and hypodermic syringes. There is a great deficiency in all sorts of surgical matériel and dressings of all classes.

(f) *Clothing*.—All patients admitted to hospital were short of some article of clothing. In many cases patients were retained in hospital for a long time after they were able to be discharged because they could not be supplied with enough clothing to return them to duty. In some centers they were sent to convalescent companies and their struggles continued there with a result nearly as unsatisfactory.

(g) *Bathing and Toilet Arrangements*.—The conspicuous defect of all hospitals was inadequate bathing and toilet arrangements. In most hospitals where these installations were practically sufficient they were not employed to the best advantage and were usually kept in a wretched state of police. It seems that the Russian is unable to manage a water-closet. There is so much evidence of this defect in all phases and departments of domestic life, not alone in hospitals, that it seems to be a national characteristic.

(h) *Disinfecting Apparatus*.—But very few hospitals were provided with efficient and sufficient disinfecting arrangements. Many of them were improvised but were operated with such great inconvenience

and difficulty that they were not utilized even to the extent of their capacity and efficiency but were simply kept for show more than practical utility. There was an attempt made in every hospital to provide a chamber for sulphur disinfection, but the supply of sulphur was usually short.

(i) *Subsistence*.—The food supply and mess facilities in all hospitals had not improved, but in many it had rather grown worse in the last few months because the economic conditions in the Crimea had declined as the purchasing power of the manufactured rouble constantly grew less. The amount of money allotted for the purchase of food was not sufficient and the ration as issued was never complete, so that it was an everlasting frantic struggle in the Commissary Department of the hospital to keep the patients fed. The civil society hospitals were able to manage their mess much better than military hospitals because they were supplied with funds from their societies with which they supplemented the money allowance or ration provided by the military supply department.

#### CONVALESCENT DEPOTS

There has been some improvement in this service, but it is still very inefficient, as it almost fails in its object in returning the sick to duty. In all the companies there were among the convalescents some who were so obviously ill that they should have been continued as patients in hospital, and others who were permanently disabled and should have been separated from the military service. A few, quite fit for duty, were not provided with sufficient clothing, and a number had been in the care of the Sanitary Department in some way or other, most of the time in convalescent companies, for as long as six months. There was no arrangement for classifying new admissions and passing them through various grades of their convalescence to fit them to return to duty. There was much that might have been accomplished by a greater amount of enterprise and energy on the part of commanding officers, but yet they had their unalterable difficulties in obtaining sufficient food, clothing and the facilities for keeping the men clean.

If the economic problem in the Crimea were solved, it would be a great deal easier to proceed with the improvement in the details of administration as, whatever is done in the best administrative way, the fact remains that many material difficulties cannot be overcome without greater resources and so, with the very best administration, conditions will remain discouraging enough to anybody connected with the sanitary service.

## DISTRIBUTION OF MEDICAL SUPPLIES

The Medical Supply Department is one of the worst features of the sanitary administration, but the Chief Surgeon is well aware of this and is making an effort at reorganization that has promise of giving better results.

There are army and Red Cross medical depots at Sevastopol and Theodosia in which there was a considerable stock of drugs and dressings and some equipment, but there was not a single thermometer or hypodermic syringe, very few instruments, and no salvarsan products. There were no distributing centers in the hospital areas in the large cities. There had been a sort of an advance medical supply depot on a railway car at the field headquarters of the army at Jankoi, but that had been taken away by the II Corps when it moved from this region.

The whole system is so inefficient that the only way supplies are obtained is by messengers sent out from the hospitals to the supply depots to secure what they can. The result is that medical supplies of any kind coming into the possession of any organization by design or accident are kept and secreted, no difference in what quantity they are found and without consideration for the immediate or remote requirements of the organization.

## REGIMENTAL MEDICAL EQUIPMENT

All regiments have some parts or pieces of the British field regimental equipment, but most of it was in very bad condition and much of it no longer serviceable. There was usually a sufficient quantity of plain surgical dressings and bandages, but a general shortage of hypodermic syringes and thermometers. All medical officers complained bitterly of their deficient equipment and inability to secure medical supplies.

## CHOLERA INNOCULATION

I had been informed a few months ago by the chief surgeon's office that an organization had been provided which was rapidly carrying out the program of inoculating all the troops in the field against cholera, and from time to time I had been informed that this work was going on and was almost if not quite completed, but in my recent contact with the four army corps in the field I found no regiment which had been systematically vaccinated against cholera, and there were only a few individual cases here and there.

The chief surgeon's office has recently learned that the plan for the general vaccination of the troops in the field has failed, and a new effort is being made.

The vaccine is manufactured in the central laboratory at Sevastopol and has been supplied in sufficient quantity to vaccinate four or five



times the strength of the army. Under the present conditions, however, I doubt if very much further progress can be made because of the lack of hypodermic syringes and sufficient bottles, corks and packing material necessary to distribute a new supply of vaccine from the central laboratory.

#### INEFFECTIVES

The data in the office of the Director of the Sanitary Service do not bear a reliable relation to the actual number of ineffectives, as all the figures are prepared from inaccurate and incomplete reports. Even in local areas, the reports of the central medical office, as that of a garrison surgeon, always varied with the data acquired by actual inspection of the hospitals of the area. The chief surgeons of all areas and groups, from the medical director down, were never informed of the strength of the commands for which they furnished the sanitary service, even at the present with the considerable progress made in the reorganization of the army. As the Chief Surgeon does not know the total strength of the army or of its component units, the ineffective rate can only be estimated.

The strength of the Crimean army in the first period was about 8,000 to 10,000, which included all of the troops of General Sliaschhoff's Crimean army of defense. The chief surgeon of this corps has told me that, although he had no definite data, it was his personal opinion that during the winter months of January and February of 1920 there was so much typhus and relapsing fever that 80 per cent of the troops in the field were ineffectives from these causes.

During the same period there were from 10,000 to 15,000 sick in all of the hospitals in the rear areas. This very considerable number of sick in base hospitals was due in part to the great number of the sick and wounded brought to the Crimea when the army retired from the north and to the chronic incurable and permanently disabled cases which under normal conditions would have been separated from the military service. I saw some cases of old bone infections, following wounds received in the early days of the war in the old Russian Imperial Army, which had been in hospital for the past five years.

Taking the strength of the army in the field in this period as 10,000 with 80 per cent sick, or 8,000 ineffectives, and 12,000 additional sick in base areas, there were 20,000 ineffectives to 8,000 effectives, which makes an ineffective rate of more than 900 per 1,000.

There were so many unusual conditions in the Crimea as a result of the revolution, the persistence of civil war, the concentration of refugees (civil and military), sick and well, from all other parts of Russia, and the general lack of resources and supplies that the situation was quite

abnormal and could hardly be compared, from the standpoint of efficiency and responsibility, with the sanitary aspects of other military campaigns.

#### MORTALITY

The mortality rate of this large number of sick and wounded was not so very high, surely not as great as in an active military campaign with all of the troops in the field as in the "Crimean War" where the deaths from disease were 230 per 1,000 strength of troops engaged.

In this present campaign the greater number of sick have been gradually assembled in hospitals, where they at least had some food and shelter and received some attention, based on modern sanitary practice. The sick with the troops in the field suffered from neglect, and many died from exposure during the winter, but the average mortality rate was perhaps between 10 and 15 per cent, which was about one-half that of the real "Crimean War."

Although the sanitary conditions of the Crimean War of 1854 were of greater magnitude, created more sensation, and awakened a greater feeling of horror and protest throughout the world, this was due more to the system and the ignorance of the day rather than through the poverty of supply and the demoralization of retreat and defeat. The Crimean War finally caused the organization of efficient sanitary departments in all armies, yet the late Crimean sanitary condition has been bad enough to assure it a fair place on the list of military sanitary disasters.

#### EVACUATION OF THE SICK AND WOUNDED IN THE REAR—THE ETAP SYSTEM

A system of military communication throughout the Crimea was organized in the form of the "Etap Administration" as a bureau in the Transportation Section of General Headquarters. All the railroads and two main wagon roads were included in the system.

The headquarters of the Etap Administration were at Sevastopol with the territory of the system divided into two parts, called "Districts," for local administration.

##### *The 5th Etap District, Hqrs. Simferopol*

##### Territory Covered:

Railroads: From Simferopol to Jankoi  
From Spat to Eupatoria

Wagon roads: From Spat to Youshun.

##### *The 4th Etap District, Hqrs. Jankoi*

##### Territory Covered:

Railroads: From Jankoi to Theodosia  
From Vladislavoska to Kertch.

Wagon roads: From Jankoi to Youshun.

This system of communication provided for the transportation of troops and material between all base centers and the front, and it was used for the evacuation of the sick and wounded from the army zone to the hospitals in the rear. It provided for the movement of everything in the military service, dead or alive, passing in either direction between the front and the rear.

The supreme advantage of the system was that, after being once organized, set down on paper, and charted (see sketch attached), nearly all responsibility for administrative supervision and detail seemed to cease and its function was carried on automatically.

As an administrative idea it was wholly satisfactory because it provided for all transportation requirements and for the peace and tranquillity of the administrative officers. If in any way it failed in its function the results were charged to the victims themselves, who seemed to be considered responsible for having upset a perfect plan.

The sick and wounded from collecting points at the front were directed by the sanitary personnel to the nearest Etap station, and from there they were passed on to the rear by the Etap administration with such medical assistance as is given by such dressing stations or other local sanitary organization as might be found at the Etap stations. In the scheme of evacuation of the sick and wounded it was considered that some medical establishment for their care would be provided at all Etap stations, but as a matter of fact the ideal was not always attained.

The hospital trains were moved by the Etap administration on the request of the Sanitary Department. The greater number of the sick and wounded were transported in this way, especially the bed cases, but walking cases were passed along directly from one Etap station to another.

As the Medical Department controlled no transportation except the hospital trains and had no organization for the movement of the sick and wounded, the Etap administration could keep the sick and wounded going in the right general direction so that they eventually arrived at their destination without very much confusion. Great assistance was given to the Etap evacuations by society organizations—Red Cross, White Cross, etc.—and especially the White Cross which provided eating and rest stations at principal points so that patients found it easy and practicable, in going from one Etap station to the other, to follow the chain of White Cross refreshment and rest stations.

In the same way, when individual soldiers and small groups or detachments were moving in either direction they usually enjoyed the

advantage of the refreshment and rest stations, so that the sick and the well made their travel much under the same condition.

The personnel provided for each station was known as "Etap Companies" and "Etap Half-Companies," although they consisted of small detachments. There were twenty of these detachments distributed over the peninsula so that some Etap personnel was to be found at all Etap stations. At the larger railway stations there was always an officer who acted in somewhat the same capacity as a railway transport officer in our own service.

The whole system was very poorly administered, but on the whole it served a useful purpose and reduced to a considerable degree the confusion that would have resulted without it.

#### MILITARIZED MEDICAL SERVICE OF THE CRIMEAN RAILWAYS

The Sanitary Department has the assistance of the Railway Medical Service, which was a permanent establishment of the Russian state railways for the benefit of the railway employees.

The railways were taken under military control but were operated and managed by the staff of the old state railway system. The Medical Department remained under direct control of the railway administration as it was before the war, so that the Sanitary Department of the army had no direct control over it but could always use its resources for military purposes.

This relation of the Railway Medical Service to the Sanitary Department had its technical defects which permitted military patients to get into the railway hospitals where they were lost to the military control and to the accountability of the Sanitary Department. Under the circumstances, however, this was a matter of very little practical importance because the Sanitary Department was not always able to maintain its accountability for its patients in other hospitals which were under its direct supervision. It so often happened that the absent sick were not returned to their organization that the regiments and divisions set up their own hospitals out of the line of control of the Sanitary Department, and kept their sick in hospital under their own direct supervision in order to return them to their organization when discharged from hospital.

The railway system had two militarized sections, one extending from Sevastopol to Bahtchisaray and the other from the front to points just south of Jankoi, on both branches. These sections were operated by military personnel, as they were considered to be in the zone of the army and the hospitals of these sections were under direct administra-

tion of the Sanitary Department of the army with some space reserved for the railway employees.

There were three classes of medical service provided for different stations and districts:

1. Hospitals, called "infectious barracks."
2. Dispensaries, with doctors in charge.
3. Dispensaries, with nurses in charge and without doctors.

The hospitals continued their regular functions in taking care of the sick and the dispensaries became emergency hospitals and dressing stations.

The Railway Medical Service was of great assistance in the evacuation of patients and in the operation of hospital trains, as they became, in a way, the reception points for the former and the supply stations for the latter and, on the whole, rendered a valuable auxiliary service quite suited to the indefinite organization and dispersed form of administration of the Sanitary Department of the army.

#### CONTAGIOUS DISEASES

##### I. TOTAL CASES IN HOSPITAL

	<i>May 15</i>	<i>May 25</i>	<i>June 5</i>	<i>June 15</i>	<i>June 20</i>
Typhus fever.....	1,895	1,623	1,276	939	843
Relapsing fever.....	3,857	3,763	3,208	2,931	2,674
Typhoid fever.....	67	82	70	51	32
Dysentery.....	83	24	25	32	86
Intestinal diseases.....	....	....	....	41	44

##### II. ADMISSIONS TO HOSPITAL

<i>Period</i>	<i>Typhus fever</i>	<i>Relapsing fever</i>	<i>Typhoid fever</i>	<i>Dysentery</i>
(Add 13 days to each date)				
April 1-7.....	471	706	17	.....
April 8-15.....	270	436	27	.....
April 16-23.....	189	292	13	.....
April 23-30.....	206	438	26	.....
May 1-7.....	276	485	10	.....
May 8-15.....	169	277	12	.....
May 16-22.....	99	446	2	23
May 23-31.....	164	475	6	37

#### SANITARY DEPARTMENT

##### TYPHUS AND RELAPSING FEVERS—RELATIONS OF ADMISSION RATES TO ETIOLOGICAL FACTORS

If typhus and relapsing fevers are transmitted in the same way, by the louse, it might be expected that the relative rates of admission, whatever they may be, might rise and fall in each disease the same way through the different seasons.

This inference, however, is not sustained by facts, because during the winter the number of typhus cases in hospitals were much more numerous than relapsing fever cases, the ratio being about 3 to 1. With the coming of summer and the better natural facilities for louse disinfection, typhus fever is rapidly disappearing while relapsing fever admissions do not fall at the same rate. From the 15th to the 30th of March, I inspected 43 hospitals and secured from the hospital administration what may be accepted as an accurate account of the total number of patients and the number of typhus and relapsing fever cases. In most all of the hospitals there were more typhus than relapsing cases, although in a few of them, where an attempt had been made to avoid admissions for typhus, more relapsing fever was found.

The following table is prepared to show the relative numbers of typhus and relapsing fever cases in hospital for different periods and the more rapid fall in the numbers of typhus than relapsing fever:

PATIENTS IN HOSPITALS—FROM REPORTS AND INSPECTIONS

<i>Date</i>	<i>Total patients</i>	<i>Typhus fever</i>	<i>Relapsing fever</i>	<i>Ratio</i>
March 15, in 13 hospitals, Sevastopol. . . . .	3,382	1,609	662	2.5:1
March 30, in 43 hospitals. . . . .	11,130	3,528	2,314	1.5:1
April 30, at Djankoi. . . . .	576	178	194	0.8:1
June 15, in 43 hospitals. . . . .	11,500	939	2,921	0.32:1
<i>Admission ratio (all hospitals reported):</i>				
June 1-15th (cases admitted). . . . .		63	921	.....
<i>Cases remaining:</i>				
June 20, in 43 hospitals. . . . .		843	2,674	.....

The present chief of the sanitary corps told me in March, when he was chief surgeon of the III Corps, that during the preceding winter months, December, January and February, the ineffective rate in his corps was as high as 80 per cent with a strength of the corps from 8,000 to 10,000, that a greater part of all hospital cases was made up of typhus and relapsing fever, and that typhus cases largely predominated.

Beginning with December and running through to June, the ratio of admission rates for typhus and relapsing fever is as follows:

December, January and February. . . . .	5:1
March. . . . .	1.5:1
June. . . . .	.2:1

From five times as much typhus as relapsing fever, in the dead of winter, the typhus admissions have fallen so rapidly as to have almost disappeared in June, while the relapsing fever admissions are falling so much less rapidly that now in the summer time there are more than three times as many relapsing as typhus fever cases in hospitals.

The cause of the difference of admission rates of these two diseases must have some direct relation to etiology favorably affecting the transmission of typhus under good weather conditions, which does not, in a like measure, reduce the incidents of relapsing fever, although the admission rate for relapsing fever is considerably improved in this same period.

As the louse has been definitely convicted as the transmitting agent of typhus fever, the fall in the admission rate of this disease is consistent with the improvement of the conditions upon which lice infestation depends. But as these conditions which permit the removal of lice from the body do not as favorably affect the incidence of relapsing fever, it must be that relapsing fever is transmitted by another agent than the louse and this agent is, most probably, the bed-bug. I believe that this evidence leads to the conclusion that typhus and relapsing fevers are not transmitted in the same way, and that the bed-bug is the most important factor in the transmission of relapsing fever.

This definite position in etiology that the bed-bug thus assumes, is further supported by a more recent experience in the prevailing epidemic of plague in Constantinople.

The late reappearance of the plague in an entirely new focus after its complete disappearance for two months and the failure to find infected rats, at any time during the course of the epidemic, have centered attention on the bed-bug as the transmitting agent. Although the circumstantial evidence is most convincing, sufficient proof has not yet been found to secure conviction.

After the long, patient, persistent and sometimes successful endeavor to pester humanity, without having won any special distinction, the bed-bug can now be specifically accused of certain etiological agencies which assures his scientific position for the future and removes him from the contemptuous classification of an "also ran."

The words of the poet, in this connection, seem to be almost prophetic:

The June bug has his wings of gold,  
The lightning bug his flame;  
The bed-bug has no wings at all  
But he'll get there just the same.

#### TYPHUS AND RELAPSING FEVERS

##### *American Red Cross Russian Refugee Camp, Proti Island, Constantinople*

Refugees from South Russia of both sexes and all ages were brought to Constantinople under the care of the American Red Cross when Odessa was occupied by the Bolsheviks early in February, 1920. The first and larger group arrived at Proti Island, Constantinople, February, 1920.

A smaller group came on another ship four or five days later, but as the two groups were not separated, all cases admitted within the first nineteen days after the first arrival—i. e., prior to March 2—are considered as infected prior to arrival. Fourteen days are counted for period of incubation and five days for the average day of disease on admission, as nearly all cases were admitted on the fourth or fifth day of the disease.

### *Typhus Fever:*

Total number of refugees.....	1,081
Total admissions, typhus fever.....	105
Admissions, in course of disease, February 12.....	27
Admissions after February 12, and before March 2, infected prior to arrival on island.....	47
Total admissions from infection prior to arrival.....	74
Admissions after March 2 from infection on island.....	31
Total deaths.....	8
Deaths without complication.....	5
Deaths with complication:	
Apoplexy, after fall of temperature.....	1
Uremia, after fall of temperature.....	1
Otitis media, after fall of temperature.....	1
	— 3
Mortality rate, all cases (per cent).....	7.6
Mortality rate, uncomplicated cases (per cent).....	4.7
Deaths, from admissions on arrival in course of disease (at Proti).....	4
Deaths, from admissions after arrival (at Proti).....	4
Mortality rate from cases admitted on island in the beginning of their disease and receiving good treatment throughout course of disease (per cent).....	5.0

### *Relapsing Fever:*

Total admissions, relapsing fever.....	82
Admissions on arrival.....	20
Admissions prior to March 2.....	42
Admissions after March 2 (infections on island).....	20
Deaths.....	1
Mortality rate (per cent).....	0.8
Total admissions, all causes.....	514
Surgical cases.....	43
Typhus fever.....	105
Relapsing fever.....	82
Other medical cases.....	284
Admissions, typhus fever from total refugees (per cent).....	9.6
Admissions, relapsing fever from total refugees (per cent).....	7.5

The relative rates of admissions and death in this community were practically the same as in the several groups in the Crimea.



*Central Laboratory, Sevastopol*

RELAPSING FEVER DIAGNOSIS BY SPIRILYSIS

Dr. Peter Maslakovez is working in the Central Laboratory on a method of diagnosis for relapsing fever, based on the principle of spirilysis in which a laboratory specimen of living spirilla is added to the serum of a suspected case with a resulting spirilysis as a positive reaction.

The following technique is employed:

(a) About 2 c.c. of blood are taken from the patient, to which is added the same quantity of a 1½ per cent solution of sodium citrate.

(b) The mixture is slightly agitated and allowed to stand for from one to two hours, when the spirilla will rise in the serum layer, where they are found for the subsequent stages of the process.

(c) Five c.c. of blood are taken from a suspected case and allowed to coagulate in a test tube to secure the serum.

(d) A capillary pipett is marked in two equal divisions and filled to the first mark with suspected serum and to the second mark with the control serum containing spirilla.

(e) Both sera are well mixed by expulsion and redrawing with care to avoid air bubbles when the mixed sera are finally drawn into the pipett, which is afterwards sealed in a flame.

(f) The pipett is incubated at 37° C. from one-half hour to two hours. One-half hour in incubator partially and two hours completely dissolve the spirilla, leaving only their shadows.

(g) Some specimens of control spirilla are too resistant to be affected by relapsing fever serum. For this reason the method requires three different specimens of control spirilla and the incubation of three different mixtures in pipetts. Spirilla are of different strains.

(h) After the pipett tubes are incubated their contents are expelled on a slide and examined in a dark field.

(i) The diagnosis of the suspected serum is considered positive when in any one of the tubes the spirilla of control serum are dissolved or partially dissolved or show by their movements that they are greatly distressed by a hostile environment.

This method is used clinically for diagnostic purposes in Sevastopol and other hospitals, from which specimens can be sent to the Central Laboratory.

CULTURE OF SPIRILLA OF RELAPSING FEVER

Dr. Maslakovez gives the following method for making cultures of the spirilla of Obermeier:

(a) Ascitic fluid in a test tube is partly coagulated by heating at 65° C. in a water bath for one-half hour.

(b) A capillary pipett is filled with the citrated serum of blood containing the spirilla.

(c) The coagulated ascitic fluid in the test tube is stabbed with

the capillary pipett from which the serum is expressed into the body of the medium.

(d) The surface of the medium is covered with sterile liquid petrolatum to exclude air as the organism is anaerobic.

(e) Incubation at 16° to 20° C. for five days causes an increase in length to 40 microns.

(f) By incubation for two or three days longer the spirilla are shortened to normal length.

(g) Following is a record of a late experiment:

January 25—culture planted;

January 29—culture normal length, 12 microns, normal movements;

February 3—spirilla very long, 40 microns;

February 5—spirilla short, normal length.

(h) Previous published record is fourteen days duration of living culture. Dr. Maslakovez has kept cultures alive for twenty-nine days.

#### MANUFACTURE OF VACCINE

The following method is employed for the manufacture of cholera vaccine which is practically the same as that for typhoid vaccine:

(a) Culture is started from six different typical pure cultures from recent cases by washing with normal salt solution and mixing.

(b) One c.c. of the mixed culture is planted on agar in a large, flat medicine bottle plate called a "mattress."

(c) Sixty mattresses are planted in one series and incubated at 37° C. for twenty-four hours.

(d) Each mattress is then washed with 25 c.c. normal saline solution containing  $\frac{1}{2}$  per cent carbolic acid which forms the vaccine.

(e) Each mattress is controlled by an examination by Gramme's stain for pure culture.

(f) All pure culture mattresses are mixed in one emulsion.

(g) Emulsion is filtered through cambric cloth and heated in water bath at 58° C. for one hour and then cooled.

(h) The second control is made by mixing 1 c.c. of the emulsion with 50 c.c. bullion and incubating for two days when, if culture remains clear, it is considered positive for sterility.

#### BACTERIAL COUNT

Dr. Maslakovez considers Wright's method of counting organisms as inexact, and he has devised the following method which he published in "Russky Vrach" ("The Russian Doctor") in 1918:

*Requirements.*—The requirements are—

(a) An "Ocular Net" which is a glass slide of such a size as to be dropped into the eye-piece of a microscope and marked in squares.

(b) Determine the ratio of each square of the ocular net to the field of vision by comparison with the Thoma-Zeiss squares of 1/400 mm.

(c) Use Eye-piece—No. 20.

(d) Microscope tube—180 mm.

(e) Objective—1/12.

(f) Ratio ocular net squares to Thoma-Zeiss squares = 16:1.

(g) Calculations:  $1/400 \text{ mm.} \times 1.16 = 1/6400$ , the size of the ocular net squares.

(h) Cover glass for examination is 15 mm. square and has an area of 225 sq. mm. to be examined.  $225 \div 1/6400 = 1,444,000$ , the number of ocular squares in 225 sq. mm. of field to be examined.

*Counting bacteria in 1 c.c. vaccine:*

(a) Make emulsion of vaccine 1-50 in salt solution.

(b) Make an emulsion of vaccine 1-100 salt solution.

(c) Add .02 c.c. of (a) to 50 c.c. distilled water to make first dilution.

(d) Add .02 c.c. of (b) to 100 c.c. distilled water to make second dilution.

(e) Examine first diluted emulsion on cover glass 15 mm. square; cover glass must be completely covered.

(f) Place cover glass in incubator perfectly level for about one hour to dry.

(g) Fix with methyl alcohol.

(h) Use cover glass as microscopic slide; add a drop of Canada balsam on square and cover with cover glass.

(i) Count 500 ocular squares.

(j) Examine second diluted emulsion in same way and average result of both counts.

(NOTE: As this method of counting bacteria does not seem to possess any particular or peculiar advantage over the Wright method, but as the Russian doctors seem to make a great deal of fuss over it and consider it very important, it is presented only as an indication of their leaning to originality and a desire to establish scientific independence.)

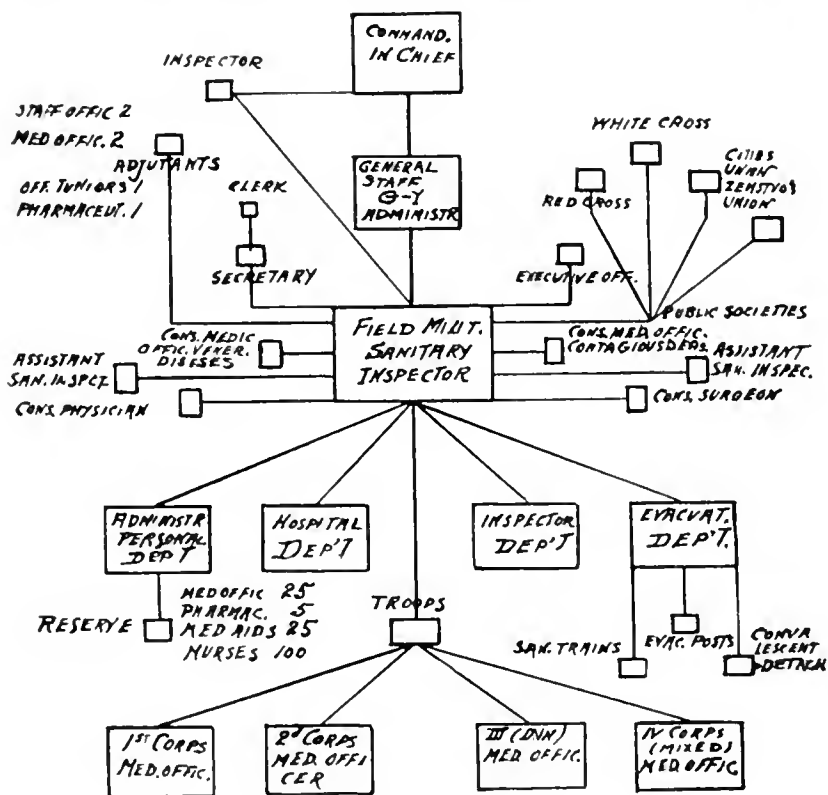
I am not sure that a count of any kind is made of each batch of vaccine. The director of the laboratory insists, however, that each batch is always carefully counted. In the British Central Laboratory in Constantinople no pretense is made of counting each series of cultures. The number is estimated by the degree of opacity or the color density of the new culture in comparison with the control emulsion which has been carefully counted.)

#### ORGANIZATION OF SANITARY DEPARTMENT

*Central Administration.*—The plan of organization of the Sanitary Department, like that of other branches of the Crimean military establishments, is that of the old Russian Imperial Army as shown on Table I. The limitations of personnel and matériel made it impossible to erect an exactly similar structure, but the old Imperial system was always taken as a model to be imitated and a guide to be followed in the performance of the duties of the Sanitary Department. The application of this principle led to complications in many situations which might have been handled in a more simple and direct manner.

The great progress made in the reorganization of the Crimean Army since April 1, 1920, has greatly improved the administration of the Sanitary Department and under the present direction conditions are constantly improving.

But with all the ability and energy with which this service could be directed, the deficiency of trained personnel and the shortage and

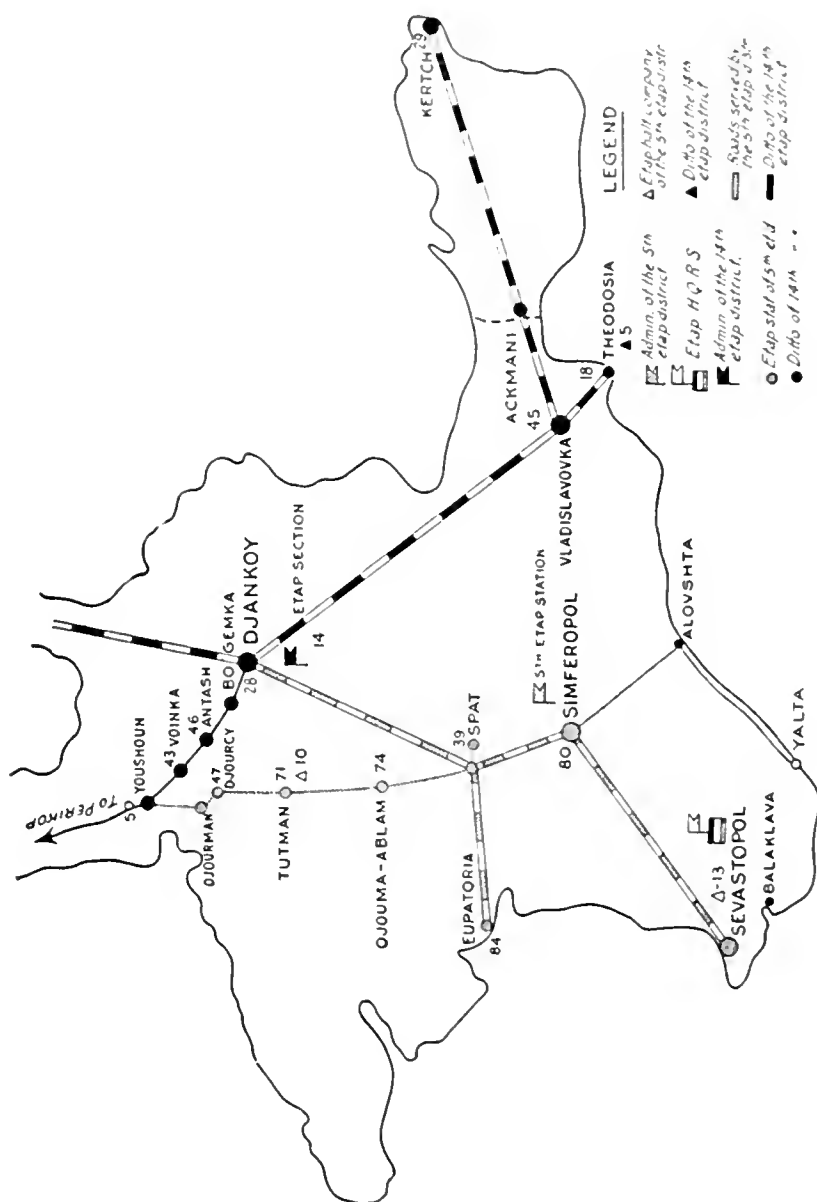


ORGANIZATION OF SANITARY DEPARTMENT

even total lack of essential materials make the whole situation difficult in many ways and utterly hopeless in some respects.

Some of the obstacles are so insurmountable that, whatever the result may be, the Sanitary Department and its director deserve more credit for the courage with which the struggle is carried on under the most discouraging conditions than an unfavorable criticism for the most phases of failure.

*Sanitary Personnel.*—The personnel in different grades as provided by the tables of organization and the numbers actually found in the



service, for the four army corps and base units, is shown in Table II. The numbers given in the second category are greatly overstated, as the figures refer to the time when the units were formed from the personnel of older organizations. No provisions have been made for the losses which have occurred since that time.

Furthermore, this condition constantly grows worse because the number of doctors, fclchcrs, nurses, etc., already accounted for, cannot be increased in substantial numbers; at the same time the increase in the strength of the old military units and the formation of new ones are going on energetically by mobilizing the population of the newly occupied, as well as the old, territory and by the enlistment of a large number of recently captured prisoners.

The table of organization is not systematic because it is based on resources of personnel of old units from which new ones are constituted. The organization tables give a sanitary strength of 20 per cent of the total strength, and the actual numbers in service are shown to be more than 18 per cent of the total strength. This percentage of the sanitary strength is based on the total strength of 45,000 for the four army corps. A more applicable calculation should be made on a basis of 80,000, the total number of the military personnel in the Crimean army, which would reduce the sanitary strength to about 10 per cent.

The personnel of medical units in the rear, both under military and society direction, is shown in Table III.

The several sanitary units of the evacuation division of the Field Sanitary Inspector's Office, with the personnel of each, are shown in Table IV.

*Personnel Base Hospital—500 beds.*—The organization and the actual service personnel for base hospitals is shown, by an example of a 520-bed hospital in Sevastopol, in Table VII.

The actual personnel provided for base hospitals as determined by inspection of 27 units is shown in Table VIII.

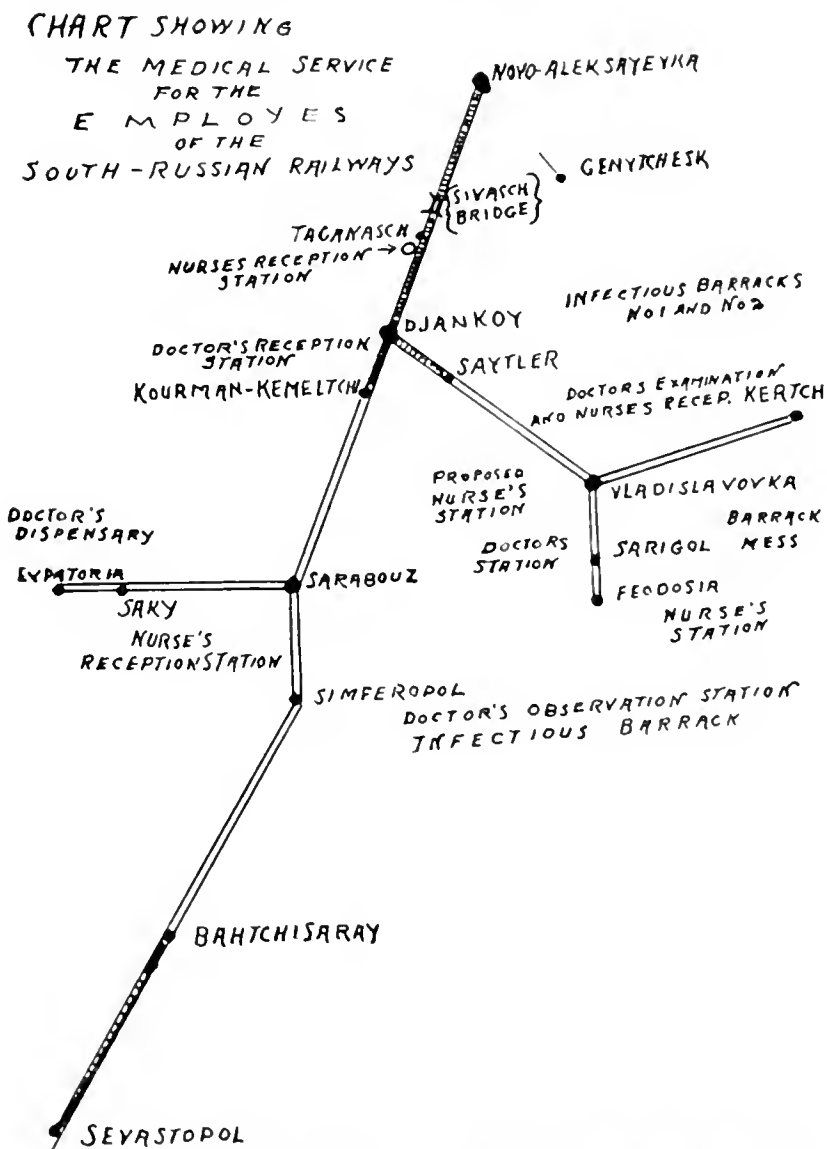
The total number of beds averaged on a capacity of 500 beds to each unit shows a personnel of about 150 for each unit.

*Hospitalization.*—The projection and actual preparation of hospital beds to meet sanitary requirements has received careful office attention, although the actual attainments do not always compare with the tabulated figures.

Table IX was prepared in the C. S. O., May 15, and Table X, from the same source, shows this status as of June 15. The first table shows a project for 24,580 beds and the second one for 28,039 beds, which represents a consistent plan for an increase of about 3,500 beds. The first table shows also 19,285 prepared beds and the second table 17,917

beds, but this only exhibits the difficulty encountered with figures and has nothing to do with facts, as one need not understand that 1,200 prepared beds have disappeared in one month.

The last table prepared June 15 has, most probably, a more definite relation to the actual state than the preceding one.



DOCTOR'S RECEPTION STATION; DOCTOR'S OBSERVATION STATION, INFECTIOUS BARRACK No. 1;  
INFECTIOUS BARRACK No. 2.

TABLE II.—SANITARY PERSONNEL  
TOTAL STRENGTH—ORGANIZATION TABLE AND ACTUAL SERVICE

[illegible]



The preparation of sufficient hospital space to provide 7,500 vacant beds in anticipation of the demand to be made on the Sanitary Department by the recent offensive seems to show an efficiency in the Sanitary Department which is quite commendable.

**TABLE III**  
**SANITARY PERSONNEL—MEDICAL UNITS IN REAR AND AT BASE**

	Organization						Actually in Service					
	Surgeons	N. C. O. Fieldiers	Nurses	Apothecar.	N. C. O. Adminstr.	Sanitaris Soldiers	Surgeons	N. C. O. Fieldiers	Nurses	Apothecar.	N. C. O. Adminstr.	Sanitaris Soldiers
<b>SEVASTOPOL</b>												
Military institution.....	61	102	95	31	46	760	49	74	93	31	46	555
Private organization.....	25	.....	.....	.....	18	270	19	.....	.....	.....	15	178
Total.....	86	102	95	31	64	1030	68	74	93	31	61	736
Total, 1408							Total, 1063					
<b>SIMFEROPOL</b>												
Military institution.....	59	75	106	5	43	785	59	40	106	5	43	599
Private institution.....	25	.....	.....	.....	14	222	19	.....	.....	.....	14	129
Total.....	84	75	106	5	57	1007	78	40	106	5	57	728
Total, 1334							Total, 1014					
<b>EVPATORIA</b>												
Military institution.....	33	36	34	12	34	433	31	22	30	6	34	375
Private institution.....	15	.....	.....	.....	4	116	13	.....	.....	.....	4	84
Total.....	48	36	34	12	38	549	44	22	30	6	38	459
Total, 717							Total, 599					
<b>FEODOSIA</b>												
Military institution.....	43	74	101	12	32	460	43	43	99	12	32	418
Private organization.....	41	.....	.....	.....	31	396	38	.....	.....	.....	30	362
Total.....	84	74	101	12	63	856	81	43	99	12	62	800
Total, 1190							Total, 1097					
<b>KERCH</b>												
Military institution.....	58	63	71	7	35	678	53	46	61	6	35	554
Private organization.....	9	.....	.....	.....	6	74	9	.....	.....	.....	6	74
Total.....	67	63	71	7	41	752	62	46	61	6	41	628
Total, 1001							Total, 844					
<b>YALTA</b>												
Military institution.....	13	2	25	2	.....	.....	13	2	22	2	.....	.....
Private organization.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total.....	13	2	25	2	.....	.....	13	2	22	2	.....	.....
Total, 42							Total, 39					
<b>DJANKOY</b>												
Military institution.....	7	.....	.....	.....	6	84	3	.....	.....	.....	4	63
Private organization.....	5	.....	.....	.....	5	53	4	.....	.....	.....	3	9
Total.....	12	.....	.....	.....	11	137	7	.....	.....	.....	7	72
Total, 160							Total, 86					
<b>BAKCHISARAY</b>												
Military institution.....	7	.....	17	.....	6	86	7	.....	13	.....	6	76
Total, 116							Total, 102					
<b>Grand total</b> .....	401	352	449	69	280	4417	360	227	424	62	272	3499
Total, 5,968							Total, 4,844					

TABLE IV

SANITARY UNITS UNDER THE DIRECTION OF THE EVACUATION DIVISION OF THE  
FIELD SANITARY INSPECTOR'S OFFICE

<i>Evacuation Posts</i>		<i>Sanitary Trains</i>	
Front .....	Djankoy	N1.....	Military
Rear N1 .....	Sevastopol	N2.....	Military
Rear N6.....	Simferopol	N3.....	Red Cross
Rear N6.....	Feodossia	N4.....	White Cross
<i>Convalescent Companies</i>		N5.....	Military
N1.....	Simferopol	N6.....	Military
N2.....	Sevastopol	N7.....	Union of Cities
N3.....	Kerch	N8.....	Military
N4.....	Feodossia		
N5.....	Yalla		
N6.....	Evpatoria		

PERSONNEL OF THE SANITARY UNITS UNDER THE DIRECTION OF THE EVACUATION DIVISION  
OF THE FIELD SANITARY INSPECTOR'S OFFICE

<i>Front Evacuation Post</i>		<i>Convalescent Companies</i>	
Surgeons.....	6	Surgeons.....	2
Officers.....	3	Officers.....	6 Adm't.
Clerks.....	4	Clerks.....	1
Nurses.....	10	Aids, N. C. O.....	4
Aids, N. C. O.....	4	Soldiers.....	46
Soldiers.....	10	Horses.....	8
Sanitaries.....	60	Carts.....	4
Horses.....	4		
Carts.....	2		
<i>Rear Evacuation Post</i>		<i>Hospital Train, 200-300 Beds</i>	
Surgeons.....	8	Surgeons.....	2
Officers.....	7	Clerks.....	1
Clerks.....	6	Nurses.....	4
Nurses.....	18	Aids, N. C. O.....	3
Aids, N. C. O.....	8	Sanitaries.....	40
Soldiers.....	85	Soldiers.....	4
Sanitaries.....	95		
Horses.....	11		
Carts.....	7		

TABLE V.—ORGANIZATION

PAPER SANITARY SERVICE OF AN ARMY CORPS. PERSONNEL AND TRANSPORTATION

	Personnel							Transportation		
	Medical officers	Other ranks	Nurses	N. C. O. fieldclerk	Sanitaries	Soldiers	Bearers	Total	Carts	Kitchen
<i>Corps</i>										
Corps headquarters	12							12		
<i>Corps Units</i>										
Telegraph company				1				1		
1 reserve battalion	12			4				6		
2 reserve battalions				1				1		
Engineer company	12			4				6		
Cavalry reserve regiment										
Total	38			14				22		
<i>I Division Infantry</i>										
Division headquarters	1			1				2		
Division infirmary	5	12	6	12	52	36		113	25	1
1 ambulance	4			6	20	53	108	193	38	2
Delousing detachment	1			1	7	5		14	4	
4 regiments	16			88				104		
Artillery, 1st and 2d divisions	2			4				6		
Total	29	4	6	112	79	94	108	432	67	3
<i>II Division Infantry</i>										
Division headquarters	1			1				2		
Division infirmary	5	12	6	12	52	36		113	25	1
1 ambulance	4			6	20	53	108	193	38	2
Delousing detachment	1			3	7	5		14	4	
4 regiments	16			88				104		
Artillery, 1st and 2d divisions	2			4				6		
Total	29	4	6	112	79	94	108	432	67	3
<i>Division Cavalry</i>										
Division headquarters	1			1				2		
Division infirmary	5	12	6	12	52	36		113	25	1
1 ambulance	4			6	20	53	108	193	38	2
Delousing detachment	1			3	7	5		16	4	
3 brigades—6 regiments	12			48				60		
Artillery divisions	2			4				6		
Total	25	4	6	74	79	94	108	390	67	3
Grand total	91	12	18	312	237	282	324	1276	201	9

TABLE VI  
ORGANIZATION AND ACTUAL STRENGTH, SANITARY DEPARTMENT, FIELD ARMY  
I. ARMY CORPS

	Organization						Actually in service					
	Surgeons	N. C. O. Feldchers	Nurses	Apothecarys	N. C. O. Administration	Sanitary Soldiers	Surgeons	N. C. O. Feldchers	Nurses	Apothecarys	N. C. O. Administration	Sanitary Soldiers
<i>With Troops</i>												
Corps headquarters .....	2	2			1		2	2			1	
<i>Markov Division</i>												
Division headquarters .....	1	1					1	1				
1 Infantry Regiment .....	4	17	2			48	3	7	10			30
2 Infantry Regiments .....	4	17				48	4	5	12			24
3 Infantry Regiments .....	4	17				48	3	5	9			28
Artillery brigade .....	4	8				32	4	7	1			16
Engineer company .....		2				4		2				4
Reserve battalion .....	2	1					1		1			
Total .....	21	68	2		1	180	18	29	33		1	102
	Total, 272						Total, 183					
<i>Cornilov Division</i>												
Division headquarters .....	1	1					1	1				
1 infantry regiment .....	4	17				48	4	6	9			24
2 infantry regiments .....	4	17				48	4	4	5			24
3 infantry regiments .....	4	17				48	3	3	8			18
3 div. artillery brigades .....	1	3				12						6
Separate regiment .....	2	4					1	2				
Total .....	16	59				156	13	18	22			72
	Total, 231						Total, 123					
<i>Drozdoz Division</i>												
Division headquarters .....	1	1					1	1				
1 infantry regiment .....	4	17				48	4	6	4			30
2 infantry regiment .....	4	17				48	4	4				24
3 infantry regiments .....	4	17				48	2	6				28
1 artillery division .....	1	3				12	1	2				6
2 artillery divisions .....	1	3				12	1	1				6
3 artillery divisions .....	1	3				12	1	2				6
Light howitzer battalion .....	1	2				4	1	1				4
Total .....	17	63				184	15	23	8			104
	Total, 261						Total, 150					
<i>2 Cavalry Division Don Cossacks</i>												
Division headquarters .....	1	1										
1 cavalry regiment .....	2	8				12	2	6				12
2 cavalry regiment .....	2	8				12	2	5				10
3 cavalry regiment .....	2	8				12	2	8				12
6 cavalry division .....	2	8				12	2	8				12
7 cavalry regiment .....	2	8				12	2	8				12
Don cav. artillery division .....	1	4				12	1	2				12
4 cavalry artillery division .....	1	1				12	1	2				12
Total .....	13	49				84	12	39				82
	Total, 116						Total, 133					
<i>With Medical Units, Military</i>												
Markov division infantry .....	5	12	6			52	5	8	6		2	45
Drozdoz division infantry .....	5	12	6			52	4	3	6			42
First aid of Markov div. ....	4	6				163	4	2				101
First aid of Cornilov division .....	4	6				163	4	3				117
First aid of Drozdov div. ....	4	6				163	2	4				118
Sanitary train No 6 .....	2	3	4			40	1	1	4		1	30
Line evacuation post .....	6	4	10			70	5	2	10		5	40
Field medical supply base .....		2		4		6		2		4	1	6
26 field rescue hospital .....	7	10	17	1	4	58	5	6	17	1	4	43
Total .....	37	61	13	5	22	767	30	31	43	5	21	542
	Total, 935						Total, 672					

TABLE VI.—Continued

I. ARMY CORPS

	Organization						Actually in service					
	Surgeons	N. C. O. Feldchers	Nurses	Apothecarys	N. C. O. Administration	Sanitaries Soldiers	Surgeons	N. C. O. Feldchers	Nurses	Apothecary	N. C. O. Administration	Sanitaries Soldiers
<i>Civil Organization</i>												
Feeding and first aid:												
Post White Cross N-26	1	1	5		3	12	1	1	5		3	10
Post White Cross N-34	1	1	5		3	12	1	1	5		3	12
Post White Cross N-36	1	1	5		3	12	1	1	5		3	12
Post White Cross N-32			12		3	10			12		3	10
Post White Cross N-40					3	10					3	10
Post White Cross N-42			12		3	10			12		3	10
Post White Cross N-31					3	10					3	10
Total.....	3	3	23		21	76	3	3	23		21	74
	Total, 126						Total, 124					
Grand total .....	107	303	68	5	44	1447	91	143	129	5	43	976
	Total, 1,974						Total, 1,337					

II. ARMY CORPS

<i>With Troops</i>												
Corps headquarters.....	2	2			1		2	2			1	
13 infantry divisions.....	26	101				272	26	37	31	31		140
34 infantry divisions.....	26	101				272	26	67	24			128
1 cavalry division.....	9	49				72	9	16	31			72
Separate engineer cos.....		2						1	1			
Separate telegraph cos.....								1				
Total.....	63	257			1	616	63	124	78	31	1	340
	Total, 937						Total, 637					
<i>With Medical Units</i>												
First Aid Unit.....	4				2	163	4	6			2	120
First 13 infantry divisions.....	4	8			2	163	4	7			2	118
First 34 infantry divisions.....	4	8			2	163	4	3			2	122
First 1 cavalry division.....		2		4		6		2		4		6
Field medical supply base.....	1	1				2	1	1				2
Central laboratory.....	4	1				1	4	1				1
Medical commission.....	6	4	10		7	70	6	4	10		7	50
Front evacuation post.....					4	12					4	10
Sanitary Hydrot. unit.....												
Total.....	23	32	10	4	17	580	23	24	10	4	17	429
	Total, 666						Total, 507					
<i>Civil Organization</i>												
Feeding and 1st aid post of Russian Red Cross.....	4		6		3	30	3		6		3	25
Feeding and 1st aid post NX-27, 27, 40, 41, White Cross.....	4	4	20		12	36	4	2	20		12	32
1st aid post Russian Zemstvo.....	2	2	4		3	10	1	2	4		3	10
Cavalry sanitary transport Russian Zemstvo.....					2	24					2	22
Delousing Unit of Cities, Union N-26.....		1			2	6		1			2	6
1st Aid Post N-3 of Cities Union.....	2		4		3	12	1		4		3	10
Total.....	12	7	34		45	118	9	5	34		25	105
	Total, 196						Total, 178					
Grand total .....	98	296	44	4	43	1314	95	153	122	35	43	874
	Total, 1,799						Total, 1,322					

## III. ARMY CORPS

Corps headquarters.....	2	2			1		2	2			4	
3 cavalry divisions.....	15	49				68	15	20				38
Kuban Cossack division.....	13	45				72	13	25				60
1st Aid Unit 3 C.D.....	4	6			2	163	3	4			2	75
1st Aid Kuban Cos. Div.....	4	6			2	163	3	1			1	5
Total.....	38	108			5	466	36	52			4	178
Total, 617						Total, 270						

## IV. DON CORPS

Total of Don Corps report	135	327	55	16	21	621	94	123	88	2	21	375
Total, 1,178						Total, 703						

TABLE VII

## ORGANIZATION TABLE, BASE HOSPITAL, 520 BEDS

*One Sevastopol Temporary Hospital Taken as Example*

	Organization	Actually in service
Medical officials.....	12	11
N. C. O. feldchers, medical assistants.....	16	13
Nurses.....	20	20
Apothecary.....	2	2
N. C. O. Administration.....	4	4
Sanitary soldiers and servants, male and female.....	126	78
Total.....	180	128

TABLE VIII

## HOSPITAL PERSONNEL—CRIMEA

	Commissioned		N.C.O.	Attendants and servants			Beds	Patients	Relaps. typhus	Typhus fever
	Surgeons	Nurses		Men	Women	Total				
<i>Sevastopol:</i>										
9 hospitals...	45	121	12	885	110	995	2,872	1,919	735	561
<i>Eupatoria:</i>										
3 hospitals...	13	32	19	107	33	140	500	430	162	25
<i>Jonkoi:</i>										
5 hospitals...	15	28	12	194	9	203	561	190	81	21
<i>Kerch:</i>										
8 hospitals...	45	70	31	371	39	413	1,672	1,044	410	135
<i>Feodosia:</i>										
2 hospitals...	18	19	3	86		86	300	32	14	3
Total, 27 hospitals...	136	276	77	1,646	191	1,837	5,905	3,615	1,402	745
Average personnel for 500 beds.....	11	23	6	137	16	153				

## NUMBER OF BEDS PROJECTED AND PREPARED IN THE CRIMEAN HOSPITALS, MAY 15, 1920

## Anti-Bolshevik Army—Sanitary Department

685

	Military		Red Cross		White Cross		Zemstvo		Town all		Total	
	Proj.	Prep.	Proj.	Prep.	Proj.	Prep.	Proj.	Prep.	Proj.	Prep.	Proj.	Prep.
<i>Sevastopol:</i>												
Military, 8 hospitals	4,970	3,320										
Red Cross, 2 hospitals			400	600	200	200					5,570	4,120
White Cross, 1 hospital												
<i>Simferopol:</i>												
Military, 8 hospitals	3,300	2,745										
Red Cross, 3 hospitals			445	395								
White Cross, 2 hospitals					140	138					3,885	3,298
<i>Eupatoria:</i>												
Military, 6 hospitals	2,020	1,160										
Red Cross, 2 hospitals			260	119								
Zemstvo, 3 hospitals							370	370			2,650	1,949
<i>Fronzbata:</i>												
Military, 9 hospitals	2,475	2,275										
Red Cross, 5 hospitals			1,250	842								
White Cross, 1 hospital					75	75	120	120			3,920	3,312
Zemstvo, 1 hospital												
<i>Yalta:</i>												
Military, 2 hospitals	360	360										
Red Cross, 8 hospitals			995	855								
White Cross, 5 hospitals					800	470	850	750	330	330		
Zemstvo, 8 hospitals											3,295	2,665
Town all, 4 hospitals												
<i>Kerch:</i>												
Military, 8 hospitals	3,230	2,325										
Red Cross, 1 hospital			20	32	290	140					3,450	2,491
White Cross, 1 hospital												
<i>Jan'koi:</i>												
Military, 5 hospitals	1,300	1,100									1,300	1,100
<i>Backchisarav:</i>												
Military, 1 hospital	300	140									300	140
<i>Star' Crimea:</i>												
Military, 1 hospital	100	100									100	100
<i>Semaulskaya:</i>												
Military, 1 hospital	110	110									110	110
<b>Total</b>	<b>18,165</b>	<b>12,935</b>	<b>3,370</b>	<b>2,833</b>	<b>1,415</b>	<b>1,043</b>	<b>1,340</b>	<b>1,240</b>	<b>330</b>	<b>330</b>	<b>24,560</b>	<b>19,285</b>

TABLE X.—SANITARY DEPARTMENT—CRIMEAN ARMY  
TOTAL HOSPITAL BEDS, PROJECTED, PREPARED, OCCUPIED AND VACANT,  
JUNE 15, 1920

	Projected	Prepared	Occupied	Vacant
<i>Base Hospitals:</i>				
Sevastopol.....	4,080	3,540	2,127	1,413
Simferopol.....	3,265	2,422	2,041	381
Evpatoria.....	2,590	1,565	892	673
Feodossia.....	2,985	2,366	1,171	1,195
Yalta.....	3,699	3,142	1,929	1,213
Kerch.....	2,260	1,657	787	870
Bachisaray.....	300	160	30	130
Semikolodezy.....	110	50	60	.....
Grammatikovo.....	250	150	20	130
Total.....	19,539	15,052	9,057	6,005
<i>Evacuating Points:</i>				
Evacuation Point N1.....	1,000	365	145	220
Evacuation Point N6.....	500	550	27	523
Evacuation Point, Feodossia.....	1,000	300	.....	300
Total.....	2,500	1,215	172	1,043
<i>Convalescent Companies:</i>				
Simferopol N1.....	1,000	600	552	48
Sevastopol N2.....	1,000	320	105	215
Kerch N3.....	1,000	.....	267	.....
Feodossia N4.....	1,000	130	115	15
Yalta N5.....	1,000	300	90	210
Evpatoria N6.....	1,000	300	245	55
Total.....	6,000	1,650	1,374	543
Grand total.....	28,039	17,917	10,603	7,591





# "VARICOCELECTOMY WITH SHORTENING OF THE SCROTUM"

BY MAJOR C. E. FRONK

*Medical Corps, United States Army*

(With three illustrations)

THE following operation is presented for publication as it is believed to represent a long step forward in the surgical treatment of this condition. It is not entirely original, as the main idea was given to me verbally several years ago, but nothing similar to it has been seen in the literature. In common with most military surgeons I believe that only a small percentage of varicoceles require operation. Unless the veins are greatly dilated and the scrotum very long and redundant, especially after exercise in hot weather, no operation is advisable, but the bearers of minor varicoceles do deserve enough of our time and knowledge to have their condition intelligently explained to them and especially to be reassured that there will be no resultant damage to their testicles from a course of non-interference.

Varicocelectomy has not given a high percentage of complete relief from all symptoms, largely, I believe, because the scrotum has not been shortened at the same time to thus form a natural and permanent suspensory for the testicle which, after operation, is held by the cord at least 1 inch higher due to the resection of the veins. Shortening of the scrotum by the classical methods is such a formidable procedure as to warrant its being done only in extreme cases. By the method herein outlined it is so easily accomplished and so free from danger and complications that it is done on my service in every case requiring varicocelectomy. The results have been ideal, as not a single case has failed to be relieved of all symptoms. I have not the record of the exact number of cases operated on, but it has been used as a routine on my surgical service since 1914. The operations have been done entirely under general anesthesia but probably could be accomplished almost equally as well under local anesthesia. The classical "high" varicocelectomy is first done and then followed by a cutaneous shortening of the scrotum. To accomplish this the scrotum must be grasped by an assistant and stretched to its utmost limit. With a scalpel an ellipse is marked out as shown in Fig. 1, beginning about 1 inch below the penile-scrotal junction and extending downward to a little behind the lowest angle of the scrotum. The incision is carried through the skin only, which, within the ellipse, is then dissected *from* the dartos as shown in Fig. 2. This is very easily and quickly done with a sharp scalpel.

The few small bleeding points are caught and ligated. It is absolutely essential to smooth healing that the wound be dry, as a haematoma in this location is not readily absorbed. The wound is then closed as shown in Fig. 3, with interrupted sutures beginning at the midline and working outward. The suturing is greatly facilitated by leaving the middle suture long to act as a tractor and grasping the outer edge of the skin line with an Allis forceps or similar instrument. The skin

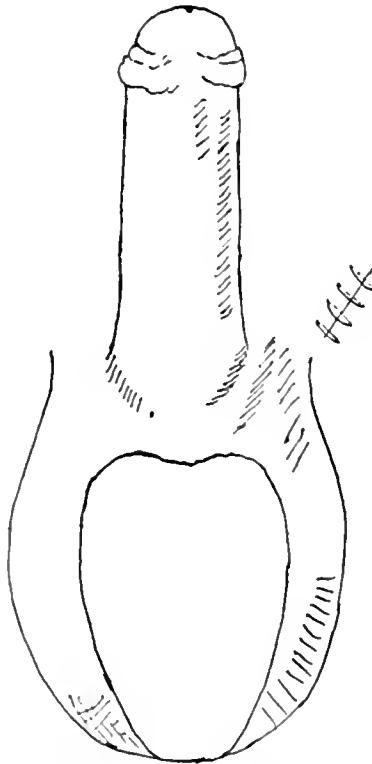


FIG. 1.—Size and shape of cutaneous ellipse to be removed.

edges can thus be pulled taut and in apposition. After the suturing has been carried outward to about three-fourths of an inch from the ends with a sharp pair of scissors, "round off" the skin, which otherwise would be left as a "dog ear," and then complete the suturing. One absolutely essential feature of the suturing is that the three or four central sutures be made to grasp entirely through the dartos, otherwise the weight of the scrotum causes the central sutures to cut through the skin, leaving a small area to heal by granulation. I have tried many

forms of suture material and different methods of suturing and have discarded everything in favor of interrupted sutures of silkworm gut. The wound should be dressed dry and the scrotum held well up with a T perineal bandage. These scrotal wounds heal as kindly as skin

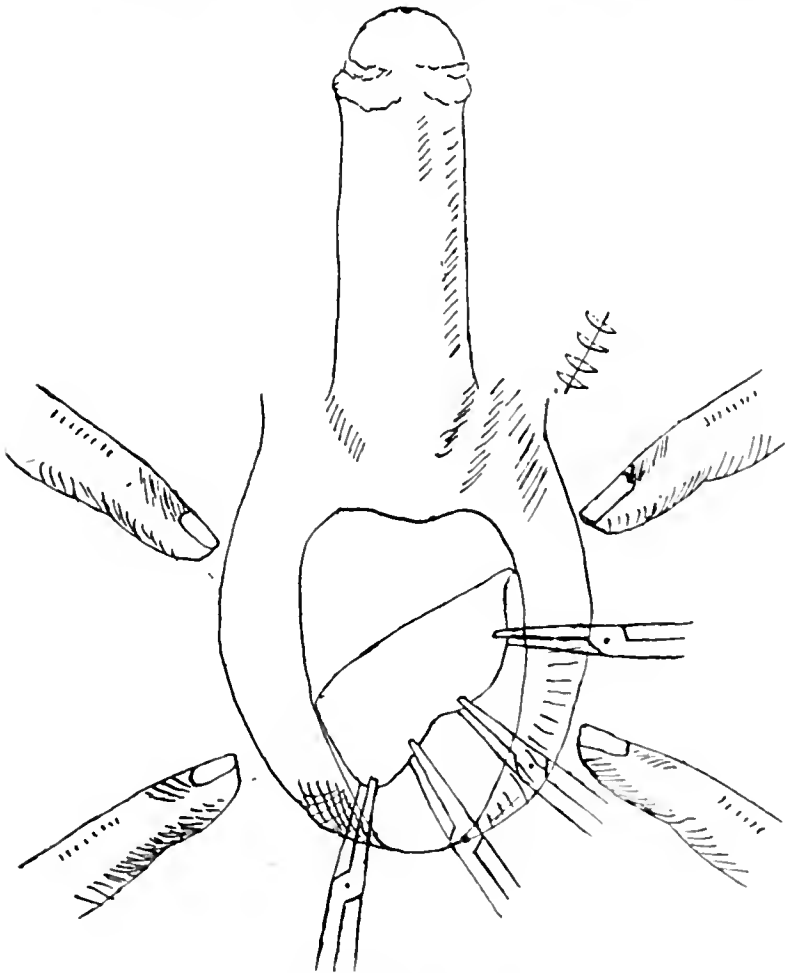


FIG. 2.—Method of removing skin.

wounds in any other part of the body, and the reaction following the operation is slight.

To avoid my early difficulties the following points are emphasized. Hold the scrotum very taut and, when marking out the ellipse, keep the raphe in the median line. Do not make the upper end of the

ellipse  $\Lambda$ -shaped but carry the incision straight across for about three-fourths of an inch. Do not err on the side of removing too small an ellipse of the skin. Carry the incision to or a little beyond the lower end of the scrotum and make the ellipse at least one-half as wide as it

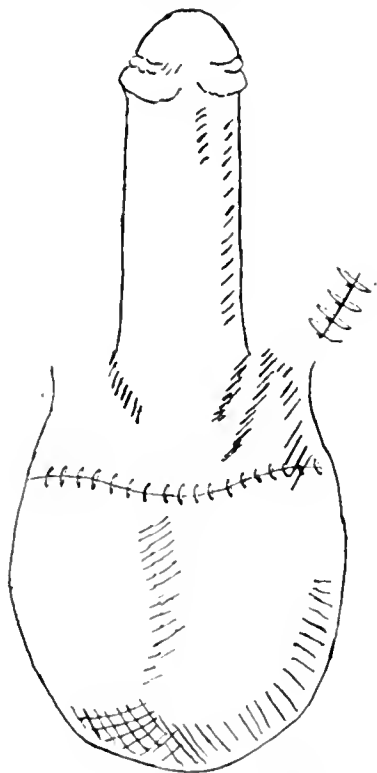


FIG. 3.—Operation completed.

is long. Carry the four central sutures through the dartos, and do not fail to "round off" the outer ends of the skin before completing the suturing. With this method of operation and by paying strict attention to the points emphasized, the patient will be given a scrotum perfectly normal in size, shape and appearance, and this without having made an incision deeper than the thin scrotal skin.



## NOTES ON THE HISTORY OF MILITARY MEDICINE

(Continued from May, 1922)

BY LIEUTENANT COLONEL FIELDING H. GARRISON

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### VIII. THE NINETEENTH CENTURY

Goethe relates that when he heard of the Diamond Necklace affair (1786) he surprised his friends by his strange abstracted demeanor, realizing, as he did, that the end of the old order of things was at hand.<sup>1</sup> Nearly half a century later, the same Goethe was bored and indifferent over the July Revolution of 1830, and professed interest only in the contemporary disputes of Cuvier and St. Hilaire, which, in his view, reaffirmed the ancient unity of French science. Enthusiasm for the protagonist of the new order led Beethoven to inscribe the MS. of his Eroica Symphony "Napoleon Bonaparte" (1804). When Napoleon assumed the imperial throne in the same year, the great composer angrily tore off this dedication and dashed it to the ground.<sup>2</sup> Under such auspices, the nineteenth century was born, and these anecdotes are symbolic of its political and social history. The "wild first year of the change of things" (1793) ushered in a new world; Napoleon's whiff of grape-shot before St. Roch (October 5, 1795) established the modern industrial democracy (*la carrière ouverte aux talents*), and with the battle of Waterloo (1815), England regained the ascendancy which had been hers in the early 17th century. The years between 1793 and Waterloo mark the height of French attainment in war and in the introduction of new ideas. In spite of the constant bloodshed, the spirit of the age of the "rights of man" was, for the Western Europeans, one of intense enthusiasm,<sup>3</sup> keyed up to a pitch that thrilled even the passive Wordsworth—

"Bliss was it in that dawn to be alive,  
But to be young was very heaven."

In variety and extent of achievement, this century surpassed the Ren-

<sup>1</sup> Goethe: *Annalen oder Tag- und Jahreshefte*, 1789. Cotta ed., p. 11. The upshot of this affair was the sensational trial of May 31, 1786, in which the weak-minded Louis XVI threw the question of his wife's honesty into a public court, thus contravening the absolutist doctrine of the divine right of kings.

<sup>2</sup> The printed title-page reads: *per festeggiare il sovvenire d'un grande uomo*. A striking feature of the enthusiasm of the Napoleonic period is the development of military music of a high order, e. g., Beethoven's *Egmont* and *Coriolanus* overtures, the funeral march in the *Eroica*, the *alla turca* in his "*Ruins of Athens*," Schubert's "*March Militaire*," the stirring *Rákoczy* of the Hungarian *soldatesca*, etc. The jingling of spurs is heard even in such late salon music as the mazurkas of Chopin, whose *Marche funèbre* is usually played at military funerals.

<sup>3</sup> "*La Révolution commença par l'enthousiasme des belles âmes de toutes les classes*" Stendhal *Napoléon*, Paris, 1898, 16.

aissance period; in poets consecrated to the cause of liberty, in philosophers, scientists and thinkers of the first order, in publicists and philanthropists who sought to create in the actual world the kingdom not made with hands, in the long line of French painters from Delacroix to Renoir, and of German composers from Beethoven to Wagner and Brahms.

In science the laws of Conservation and Dissipation of Energy, which govern all physical and chemical phenomena, were elucidated by Carnot, Mayer, Joule, Clausius, Kelvin, Helmholtz and Gibbs. Darwin, Huxley and Haeckel created the realistic view of man's origin, evolution and environment. Bichat founded descriptive anatomy in 1800. The cell-theory was developed by Schleiden and Schwann (1838-9) and was the starting point of the sciences of microscopic histology and pathology. Magendie gave a new start to experimental physiology, and Virchow to pathology. Pasteur founded bacteriology, while Koch developed the science of infectious diseases and Ehrlich serology and chemotherapy. From the data of bacteriology, preventive medicine came to be a science. Clinical medicine of the true Hippocratic type was exemplified in such great names as Bretonneau, Louis, Laennec, Trousseau, Bright, Addison, Hodgkin, Graves and Stokes. Laennec invented the stethoscope (1819). Skoda and the French clinicians vastly improved the art of percussion and auscultation, and in establishing clinical thermometry (1868), Wunderlich "found fever a disease and left it a symptom." With the invention of such new instruments as the ophthalmoscope (Helmholtz, 1850) and the laryngoscope (Garcia, 1855), the different specialties began to acquire a scientific status. The history of modern surgery is a long story, turning mainly upon the introduction of anaesthesia (1847) and of antisepsis (Lister, 1867). Operative gynaecology was created by McDowell, Sims and other surgeons of the Southern States. German medicine began to gain its ascendancy with Virchow and Helmholtz (1850). The development of immunology and serology by Pasteur, Roux, Behring, Ehrlich and others, opened out a new view of disease—the biochemical.

### *The Revolutionary and Napoleonic Wars*

In the battles which the "New French" of the Republic fought for its existence during 1792-1800, the general principles of modern warfare, its merits and defects, were developed with startling suddenness, viz., gigantic armies, with a "nation in arms" as an apparently inexhaustible reservoir of personnel; organization of these huge forces into brigades, divisions and army corps; the device *la patrie en danger* as the motor power; "living on the country" with possibilities of loot, as an expedient to secure rapidity of movement (without encumbrance of commissary wagons); and unsparing use of field artillery as the best means of destroying the equilibrium and morale of the enemy's lines.

In the initial "cannonade of Valmy" (1792) and the subsequent victories of Jemappes (1792), Wattignies (1792), Tourcoing (1794) and Fleurus (1794), these "horde tactics," frequently exploited over the roughest ground, proved an unpleasant surprise to the allied armies, bred in the 18th century doctrine of small, well-drilled, forces, attacking and retreating by set rules, fighting over open terrain in linear formation, and depending upon supply-wagons. Although desertions were rare in the Republican Armies, voluntary

enlistments began to decrease as soon as the first flush of enthusiasm was over. After Valmy, the paper strength of 800,000 was found to be 402,000 (112,000 regulars), and it was through a compulsory *levée en masse*, under the terrorism of the Committee of Public Safety, that a million men were eventually raised. Generals who failed to make good were promptly guillotined; for officers and men alike it was safer to be in the army than in Paris under the Terror. Apart from the absentee *émigrés*, this condition brought into the field the best of the physically fit as well as hundreds of defectives. France was saved by "a ferocious energy born of liberty and the guillotine . . . not by discipline and organization" (Atkinson). Organization, with a fair amount of discipline came however, through the energies and abilities of Lazare Carnot, the great Republican general and Minister of War and later through Napoleon, whose genius for assembling forces and ordnance, acting upon swift decisions, concentrating focal attacks upon definite points and inspiring morale in his men by personal contact, created a new era in warfare. A typical army corps of the Napoleonic period—three divisions of infantry and a cavalry brigade, each strongly supported by field artillery—is practically our organization of recent date.<sup>4</sup>

The medical personnel raised for these huge armies<sup>5</sup> was large, but of unequal merit, poorly trained by reason of the dissolution and non-existence of the French medical faculties during 1792-1803, and badly hampered by the arbitrary and irresponsible rulings of the National Convention, in consequence of which the medical corps of the French army was for a long time kept in leading strings by subordination, not to military authority but to civilian administration. During 1792-3, as we have seen, the number of medical officers for the Revolutionary Armies was increased from 1,400 (the first voluntary enlistment) to 8,000, reaching 10,000 in 1794, largely through the law of the Convention (August 1, 1793) placing all physicians, surgeons, health officers and pharmacists of 18-40 years of age at the disposal of the Ministry of War. On August 7, 1793, the National Convention started out well with a decree of 7 paragraphs,<sup>6</sup> establishing the autonomy of the medical corps by assigning its administration to a *Conseil de santé central*, made up of medical officers in the War Ministry (ordinary War Department administration), apportioning the number of medical officers (*officiers de santé*) in armies or military hospitals, authorizing medical instruction in the military hospitals at Lille, Metz, Strassburg and Toulon, and assimilating medical officers to corresponding grades of the line with reference to rations, forage, quarters, etc. In plain practical simplicity and intention, this decree compares favorably with the 42 articles of the hospital regulations of 1718, the finest medico-military document of the 18th century.<sup>7</sup> But hardly had the decree of August 7 gone into effect (September 1), when the fall of Robespierre established a new alignment, resulting in the pernicious law of 3 ventôse II (February 24, 1794),<sup>8</sup> through which the central *Conseil de santé* was displaced by a *Commission de santé*, under direction of a provisional "Executive Council," while military hospital administration was allocated to a "Supervising Administrative Committee," consisting of two municipal functionaries, two members of the Committee of Safety of the locality and the temporary commandant. To these latter, the chief medical officers, the war commissary and the directors were to report when so ordered. Still more ominous was the Ministerial Regulation of 30 floréal IV (May 20, 1796),<sup>9</sup> by which the authority for establishment of army

<sup>4</sup> Atkinson: *Encyclop. Britannica*, ii ed., Cambridge, 1910, ii, 601; 619.

<sup>5</sup> G. Morache: *Diet. encyclop. d. sc. méd.* (Deschambre), Paris, 1877, 2 s., viii, 92-104.

<sup>6</sup> For text, see Morache: *op. cit.*, 94-96.

<sup>7</sup> For text, see, Morache: *op. cit.*, 31-83.

<sup>8</sup> Morache: *op. cit.*, 96-7.

<sup>9</sup> Morache, 98-101.

hospitals, mobilization and disposition of ambulances at the front and transportation of the wounded was taken from the chief surgeons and given to a *Commissionnaire ordonnateur*, to whom all medical officers were subordinated, while chiefs of medical service in hospital were forbidden to have anything to do with its administration. The effect of this arrangement was to demoralize the medical service and to drive all worthwhile medical officers away from the military hospitals into the field. "From the line of the army in the field," says Morache, "the medical officers met with just consideration and equitable appreciation of their services." When they sought to elude hospital service in wartime, they got vigorous support from their colonels, who, while complying with the arrangement in peace, defeated it in war by passive resistance to orders detaching surgeons from their commands for hospital service in the interior.<sup>10</sup> The bright side of the French medical officer's experience in the Napoleonic period is therefore to be found in the field, and what he was able to accomplish was due to his military rather than his official superiors.

In the history of military medicine, Napoleon is to be regarded as a commander who accorded to favorites like Larrey or Percy every opportunity to forward medical administration, according to their lights; but who was too much preoccupied with his innumerable ambitions and plans to give it more than passing attention. Of a leading Corsican family, "born when his country was dying," bred in the backwoods cult of the *rendetta*, endowed with "more than Italian passion," a patriot in Ajaccio, an *arriviste* in Paris,<sup>11</sup> his ultimate mastery of his emotions gave him that cold marble repose in the saddle, that contempt for human life, which he was eventually to merge into a dry fatalistic disregard for the husbanding and salvage of personnel, the prime requisite in warfare on a grand scale. The reckless wastage of forces by the Revolutionary Armies had, in fact, inured him to the belief that he himself "cared little for the lives of millions of men." His conversations with Corvisart reveal the same contempt for medicine that we find in Frederick. But he was by training a soldier himself, had a lively fellow feeling with comrades in arms and was by no means lacking in a certain *grandeur d'âme* toward his medical officers and wounded men.

<sup>10</sup> Morache; *op. cit.*, 102.

<sup>11</sup> It is a mistake to regard Napoleon as a parvenu in origin. The opening sentence of his letter to Paoli ("I was born when my country was dying") is the cry of the disinherited of 1789. The family was an ancient one, if we may trust Mauro, a 16th century chronicler: "*Bonapartia gens, et nobilitas et antiqua, ante annum 1200 inter nobiles semper fuisse reperitur.*" He was rather the opportunist, who hypnotized individuals and polarized nations, but made himself, in the end, as Emerson says, the attorney of the great pushing middle class, of whom every *arriviste* sought to be "a little Napoleon." In his final phase, his relation to a possible victory became "that of the politician to the baby he kisses." Such bromides as "that passage in Josephus about Jesus" (loudly repeated in the great Paris library) or "*Il faut chaud*" (repeated twenty times at a reception) were obviously gallery-play ("defensive reactions") if contrasted with the point and pungency of his aphorisms about war and government. His early training was arid and narrow, and in society and in the presence of women, he was dry and uninteresting. Stendhal's chapter "*La cour*," tells, with characteristic malice, of his total failure to create, as "*emperor*," what the Parisians expected of him—an elegant social order. After Tilsit, even his bonhomie with comrades degenerated into the "*sécheresse*" of which his officers bore the brunt at Waterloo. (Varnhagen, Stendhal, Capt. Gronow).



Of hospitalization of the sick we hear but little, for military hygiene in the modern sense, was non-existent and the sanitary status of hospitals was almost the lowest in recorded history. Napoleon's campaigns, the favorite argument of the pacifists, present an appalling mortality from disease. Time and again he visited the wounded in hospital, listened to the reports of Larrey, Percy and Heurteloup after each battle, always inquired if the ambulances were provided with necessaries but was given to making florid promises which he sometimes forgot or was unable to keep. Seeing the pitiful condition of the wounded at Erfurt, he said, "I donate 6,000 francs daily to the hospitals out of my private funds," and galloped away, apparently oblivious to the fact that this allotment could not be disbursed (as the sequel proved) without a written order. At Berlin in 1806, he convened all his medical chiefs to the palace, and promised to make them an independent *Corps impérial*, but this, too, came to nothing. The recommendation to the Ministry for a better organization, signed by Coste, Heurteloup, Larrey, Desgenettes and Percy in 1810, was laid on the table.<sup>12</sup> Yet in Egypt, Bonaparte gave up all his horses to the ambulance service, dismounting himself and marching on foot with the infantry.<sup>13</sup> At Eylau, Baron Percy said that he could have obtained from him his very clothing for bandaging if necessary. The terrible break-down in hospitalization during the epidemics of 1813, has been attributed to the extreme parsimony of the General Intendant, M. Daru, toward the Medical Corps. The vice of the Napoleonic system (as with the Prussian General Staff in the recent war) lay in the mistaken belief that a nation in arms is an inexhaustible reservoir of personnel.

After the splendid victories of 1794-6, the direct result of Carnot's fine administration, scarcity of personnel began already to be felt. Conscription, following the Jourdan law of 1798, came to be regarded as a sentence to life service, and by 1806, one-fourth of Napoleon's conscripts failed to come up for duty. The fine flower of his veterans, the backbone of the Grand Army, were gradually eliminated through battle-losses. In 1810, the number of absentees was 80 per cent. Meanwhile, in consequence of the law of 1798, 40,000 picked veterans were constantly employed in hunting down slackers, so that, in the end, about 100,000 men were engaged in a kind of civil war within French territory. In 1810, one-third of the Grand Army (now a dynastic concern) was German in composition. In 1812, 280,000 of the 467,000 men who started on the Russian campaign were unwilling foreigners,<sup>14</sup> who rapidly deserted on opportunity,<sup>15</sup> leaving the rest an easy prey

<sup>12</sup> Morache: *op. cit.*, 103.

<sup>13</sup> This was the subject of a painting by Horace Vernet, reproduced in Cabanès: *Chirurgiens et blessés*, Paris, 1918, 401.

<sup>14</sup> Atkinson: *op. cit.*, 602, 619.

<sup>15</sup> "Un colonel de mes amis me racontait, en allant en Russie, que depuis trois ans il avait eu passer trente-six mille hommes dans son régiment. Chaque année il y avait moins d'instruction, moins de discipline, moins de patience, moins d'exactitude dans l'obéissance." Stendhal, *Napoléon*, 49.

to the allied forces at Leipzig (1813), now animated by the same fiery patriotism which had inspired the French in the Wars of the Revolution.

### *Larrey*

The most eminent medical officer of the Napoleonic period was unquestionably Dominique-Jean Larrey (1766-1842), Chief Surgeon of the Grande Armée and the inventor of "flying ambulances." Originally a choir-boy in the Pyrenees, he studied medicine, and first served in the Navy, but later joined the Army of the Rhine in 1792. He met Napoleon at Toulon (1794), served in all his campaigns, and the two became fast friends. Napoleon did not like desk-officers, would promote none who had not served with troops under fire<sup>16</sup> or who had not been wounded in action. Larrey was thrice wounded and so won the esteem as well as the affection of his chief, of whom Stendhal records that to see him ride along the line after a battle, encourage deserving and wounded officers and promote them, was one of the big moments of existence.<sup>17</sup>

Larrey took part in no less than 60 battles and 400 engagements, and indeed devoted his whole career to military surgery and to the welfare of the wounded soldier. His life was saved by Blücher at Waterloo. He was a bold and enterprising operator, with an extraordinary number of successful cases to his credit, became professor at the School of Military Medicine at Val de Grâce (founded 1796), and wherever he happened to be he set up a school of military surgery. In Egypt, he was the first to point out the contagious nature of granular conjunctivitis (1802), improved wound excision (*débridement préventif*), invented curved needles, used Labarraque's antiseptic solution to wash putrid wounds, and made other important innovations in all branches of military surgery. Early in the Revolutionary wars, he noticed that, in consequence of the old 18th century rule of relieving the wounded only after a battle, transportation to base hospitals occupied 24-36 hours, due to stalling of vehicles on the roads. Larrey reasoned that it was better administration to take the hospital to the wounded, whence arose the celebrated *ambulances volantes* (1792).<sup>18</sup> These were of two kinds, viz., light closed two-wheelers carrying two wounded men each, drawn by two horses, for rapid movement over even ground, and heavier four-wheelers carrying four men, drawn by four horses, for rough, precipitous

<sup>16</sup> "Non, Messieurs! j'aimais je ne consentirai à avancer un officier qui n'est pas allé au feu pendant dix ans." Stendhal: *Napoléon*, 45.

<sup>17</sup> "L'armée, après une victoire ou après un simple avantage remporté par une division, l'Empereur passait toujours une revue; Après avoir passé dans les rangs, accompagné du colonel et parlé à tous ses soldats qui s'étaient distingués, il faisait battre au ban et les officiers se réunissaient autour de lui. Si un chef de bataillon avait été tué, il demandait tout haut quel était le plus brave capitaine. Là, dans la chaleur de l'enthousiasme pour la victoire, et pour le grand homme, les avis étaient sincères, les réponses étaient loyales. Si le brave capitaine n'avait pas de moyens pour être chef de bataillon, il lui donnait son avancement dans la Légion d'Honneur, et, revenant à sa question demandait: 'Après un tel, quel est le plus brave?' Le prince de Neufchâteau tenait note des promotions avec son crayon. Dans ces moments, j'ai vu des soldats pleurer de tendresse pour le grand homme." Stendhal: *Napoléon*, Paris, 1898, 46.

<sup>18</sup> Ambulance service during battle became possible through the predominance of the artillery arm over the old-fashioned volley-firing of musketry in platoon formation. The early Revolutionary Armies, after disastrous experience with linear formation in close order, began presently to choose rough ground, to fight in open order over the widest possible front, and at the same time, to leave the early issue to field artillery and skirmishers, holding the majority behind the front lines for the final charge.

ground. These wagons were fitted with removable litters (provided with mattresses and rolling on castors). Both varieties had holes for ventilation and carried refreshments and bandaging material. Hundreds of these wagons were eventually in action,<sup>19</sup> beginning operations directly battle was joined, but it is said they were seldom employed outside the Guard. In the army of the North, Percy originated another kind of wagon carrying 8 surgeons, 8 hospital attendants and bandaging material, but these were not designed for evacuation. To Percy is due the organization of squads of litter-bearers (*brancardiers*), who were first employed in the Spanish campaigns (1808), and were then added by Larrey to the *ambulances rolantes*. In Egypt, Larrey employed camel transportation, with swinging side-panniers (*cacolets*) and sent his wounded from Alexandria to Marseilles in hospital ships. But in spite of the big humanitarian spirit of Larrey, the sick and wounded were frequently abandoned, through lack of transport, on Napoleon's forced marches and retreats, or else as Duncan says "were stuffed in buildings of every sort and left to die."<sup>20</sup> Of the Peninsular campaigns, General Foy recounts that "we lost four times as many men through the disorder inseparable from our system of warfare as from the fire and steel of the enemy."<sup>21</sup> An anonymous publication of 1814 abounds in gruesome details of the misery of the sick and wounded in the hospitals of 1813, which the writer styles "the sepulchres of the Grand Army."<sup>22</sup> Of the small amount of good which came out of the innumerable edicts and regulations of the National Convention, Morache observes, with a touch of sadness: "*Malheureusement il y a toujours en France un grand écart entre ce qui est prescrit et ce qui s'exécute réellement.*"<sup>23</sup> But we shall presently see that these discrepancies between plan and performance are by no means confined to France.

### *The Peninsular Campaign<sup>24</sup>*

The part played by England in the Revolutionary Wars was mainly at sea. Nelson's great victory off Cape Trafalgar (October 21, 1803) at length convinced Napoleon that he had no chance on the water.

In the Egyptian campaign, sickness began to increase after the battle of the Nile, the troops suffering mainly from granular conjunctivitis, dysentery and liver complaints. The total death rate was 109 per thousand for European and 60 per thousand for native troops; the losses from invaliding 41 and 6 per thousand respectively. In April, 1809, 39,214 men were conveyed to the island of Walcheren in 245 transports, with one hospital ship, an expedition directed against Napoleon's naval base at Antwerp. By August 15, 3,000 men were down with fever. By September 14, 8,000 were reported sick and on October 22, only 4,000 were fit for duty. The total mortality was 217 from battle casualties and 4,175 from disease, the expedition proving the failure that Napoleon had predicted ("fever will finish them.") Some sixty years before, Pringle had gone over this ground and described its diseases, with an inkling of what might happen. In April 1809, Sir

<sup>19</sup> The *Division d'ambulances* proposed by Larrey for the Rhine campaign consisted of 1 surgeon first class, 2 surgeons second class, 12 surgeons third class, 12 hospital attendants (*infirmiers*), all mounted, 44 hospital attendants on foot, and the line officers and non-commissioned officers attached to the trains. The train consisted of 12 light ambulances (8 two-wheelers, 4 four-wheelers) and 4 heavy ditto, outfitted with matériel and refreshments, and accommodating 2-4 wounded. The heavy ambulances were ordinary transport wagons (*fourgons*). Officers and privates alike carried pouches of bandaging material, and were distinguished from the rest of the command by a special scarf. Knorr: *op. cit.*, 207-208.

<sup>20</sup> L. C. Duncan: *Disease and Battle Casualties*. Seaman Prize Essay, p. 22.

<sup>21</sup> Foy: *Histoire de la guerre de la Péninsule*, Paris, 1827, i, 145. Cited by Morache, 103.

<sup>22</sup> *Les sépultures de la Grande Armée, ou tableau des hôpitaux pendant la dernière campagne de Bonaparte*. Paris, Eymery, 1813. Cited by Gurlt.

<sup>23</sup> Morache: *op. cit.*, 99.

<sup>24</sup> A. A. Gore: *The Story of Our Services under the Crown*, London, 1879, 153-160.

Arthur Wellesley arrived in Portugal, with Dr. Frank as chief medical officer of his forces. Before the end of the year, there were some 7,000 sick, of whom nearly 4,000 died. During the Peninsular War, the average sick-rate was 210 per 1,000, the principal diseases being fevers, dysentery, rheumatism and respiratory affections, with hospital gangrene and tetanus among the wounded. The soil was damp, and prior to the siege of San Sebastian (1813), there were no tents, the men living in huts of wattled boughs. There was much malingering; as many as 600 bayonets were sent back to duty in a month by clearing the hospitals of shirkers. Large general hospitals were established at Lisbon and Coimbra for the reception of sick who could not be transported. The annual loss during 1811 was 20,553, including 12,356 deaths. The death-rate during 1808-14 was 118 per 1,000, the total losses 24,930 out of 61,511 from disease and 8,889 from battle casualties. Lord Wellington's administrative arrangements were good, and he was well inclined to the medical service, in which he was ably supported by Sir James McGrigor (1771-1858),<sup>25</sup> who joined his forces in 1812, and at whose instance medical officers were first gazetted in despatches for bravery in action after the assault on Badajoz (1812). During September 1812—June 1813, some 93,348 sick and wounded were admitted to hospital. McGrigor, who had seen the finale of the fatal Walcheren expedition, reduced this sick list to 5,000, was generously rewarded and praised at the end of the war, and became Director General of the Medical Department (1816-51). In 1816, he founded the famous pathological museum and library at Port Pitt (later Netley) and inaugurated the system of medical reports and statistical army returns of the present Blue Book (1816). Much was done to reform sanitary administration by Robert Jackson (1750-1827),<sup>26</sup> of Scotland, whose books and writings of 1795-1824 lay down basic principles which might have been better enforced in his lifetime, but for his pugnacious disposition. He was an early champion for suitable military rank, emolument and honors for British medical officers, but, to the detriment of his cause, was a man of strife and contention. He reasoned that "handling a knife is the least part of a regimental surgeon's duty" and that "the medical officer claims to himself the rank of gentleman."<sup>27</sup> He estimated that 2 medical officers per 1,000 were needed in peace and 3 per 1,000 in war, and urged the employment of sanitary personnel ("health officers") in the army. The Royal Warrant of January 1, 1806, stopping 10s per diem for the hospital fund, was due to Jackson's demonstration that the sum which fed a soldier in barracks sufficed (at that time) to provide him with food and comforts in hospital.

### *The War of Liberation*

Like most military supermen who become infected with the fatal virus of world conquest, Napoleon eventually overreached himself and

<sup>25</sup> For his career, see Gore; *op. cit.*, 149-158 *passim*.

<sup>26</sup> For Jackson's career, see Gore; *op. cit.*, 119-124, and Crummer: *Mil. Surgeon*, Wash., 1922 I., 107-122.

<sup>27</sup> "Rank of gentlemen": This is a phase of the naive romanticism of the Georgian-Victorian era which so endears the 19th century to us. The "rank" implied is that of independent landed gentry. It will be remembered that the Prussian field-barber had to shave the officers and was cudgelled by his superiors if refractory. An eminent English surgeon said of that rough diamond John Hunter: "He alone made us gentlemen." Lady Chettam in "Middlemarch" refers to her family physician as having the social qualifications of her butcher. In the more realistic 20th century, it was perceived that the medical officer, if shorn of proper military authority (as was the younger Larrey at Solferino), can do nothing for relief of the sick and wounded in campaign; otherwise, he made his own social position, as did Paré or Vesalius in the past. Under democracy, the constant "I'm a gentleman" in the mouths of bounders and ruffians became so farcical that the cheerful cynicism of a wealthy "baronet" in an English melodrama—"My wife is not a lady and I am only a shopkeeper"—was greeted by the audience with spontaneous and enthusiastic applause.

did nothing well after the battle of Wagram (1809). He had been worsted by England on the seas, his wasteful campaign across the Pyrenees made Spain "the Frenchman's graveyard,"<sup>28</sup> his second marriage was a political blunder of the first order and the disastrous Russian invasion of 1812 sealed his fate. He had said with prophetic insight, "Conquest has made me what I am and conquest must maintain me." It had long been perceived by the nations gathered to finish him that his mighty empire was held together solely by his unique personality and military genius. The first steps toward Waterloo were taken by Wellington in the Peninsula and by the Prussians in the "War of Liberation."

After the annihilation of the Prussians at Jena (1806) the restrictions of the treaty cutting down the army to 43,000 men were evaded by the so called *Krümpersystem*, through which the men in the ranks were put on short service and secretly replaced as rapidly as possible, thus building up an endless chain of reserves, which, in Scharnhorst's phrase, amounted virtually to "universal service." It is upon this newer economies that the modern theory of universal training of reserves is based.

#### Goercke

During the Revolutionary Wars, the Prussian medical service had become ossified and out of date. The new spirit infused into it was due to Johannes Goercke,<sup>29</sup> (1750-1822), surgeon general during 1797-1822.

At this time, the status of medicine in Germany was backward, and apart from few names like Heim, Hufeland or Reil, there is little to its credit. Goercke devoted two years to the close study of medicine in all the leading centers of Europe, and after his discouraging experiences in the Revolutionary Wars (1792-5), the *Pépinière* for better instruction of medical officers was founded at Berlin, at his instance, on August 2, 1795. In 1801, he induced the king to establish a definite system of pensions for invalided medical officers and in the same year required personal reports on the efficiency of company surgeons to be sent in by battalion and regimental surgeons. Through his efforts, the military hospitals prepared for the reception of the wounded from Eylau (1807) were found to be models of cleanliness and good ventilation. He served through all the campaigns of the period and was so much admired by Baron Percy that the latter induced Napoleon to make a handsome contribution to the *Pépinière* in 1805.<sup>30</sup> This institution, which became the Friedrich Wilhelms Institut in 1818, graduated 1,359 medical officers during 1795-1821. In the Rhine campaign (1793), Goercke obtained funds for a movable field hospital for 1,000 patients, which rendered effective service, but there were none during 1806-9. The direction of the field hospital service was eventually assigned to Goercke (August 8, 1809), who drafted the new hospital regulations of October 2, 1809. In August, 1813,

<sup>28</sup> The ghastly features of the Peninsular Wars, including the various devices of "frightfulness" (rape and mutilation of the defenceless) have been preserved by the Spanish artist Goya in his album of etchings "*Los Desastres de la Guerra*."

<sup>29</sup> For biography of Goercke, see, Bock & Hasenknecht: *Veröffentl. d. d. Geb. d. Md.-San.-Wesens.* Berl., 1901, Heft 18, 219-260.

<sup>30</sup> For Goercke's own account of this, see Bock & Hasenknecht: *op. cit.*, 247.

the army had 3 general hospitals of 1,200 beds each, 1 reserve hospital of 3,000 beds and 9 field hospitals of 200 beds each—a total of 8,400 beds. There were 38 (eventually 124) "provincial (reserve) hospitals" in the towns, and of those the elder Graefe was director during 1813-15. Wooden barracks, introduced into Austria in 1788, appeared in Prussia in 1805-6, and a number of barrack hospitals were erected in 1813-15. Voluntary nursing was in vogue from 1800 on and received a powerful impetus under the patronage of Princess Marianne of Prussia (March 23, 1813). Transportation of the wounded was effected by water during the Rhine campaign of 1792-5. Transport wagons were introduced by Goercke in 1795, but only 3 were available in 1813. Litters and litter-bearers were not known in Prussia before Goercke's publication of 1814.<sup>31</sup> In 1822, disheartened by the constant attempts to undo his *Pepinière*, Goercke sent in his resignation to the king, after 55 years service, and died six weeks later (June 30, 1822). His successors were J. W. von Wiebel (1822), C. F. Lohmeyer (1847), H. G. Grimm (1851), G. A. von Lauer (1879), Alwin von Coler (1889) and Otto von Schjerning (1905-18).<sup>32</sup>

### *Battle Losses in the Napoleonic Wars*<sup>33</sup>

Of the 4½ million soldiers engaged in the Revolutionary and Napoleonic Armies during 1792-1815, about 2½ million died in hospital and 150,000 were killed in action. Frölich computes the total losses of the French and the Allies in the Napoleonic campaigns (1801-15) to be, in round numbers, 5,925,084. In the Egyptian campaign (1798-1800), Bonaparte lost 4,758 out of 30,000 in action and 4,157 from disease, of whom 1,689, including 40 medical officers, died from bubonic plague. On the Russian campaign (1812) his total forces, increased to 533,000 by reinforcements, had shrunk to 95,000 when he reached Moscow, although there had been only two battles, while the Russians lost about 170,000 out of 210,000. The campaign of 1813-14 cost both sides 450,000 and that of Waterloo 60,000. Between July, 1813, and March, 1814, there were 133,965 sick and wounded in the Prussian military hospitals, and of these 15,748 died, 84,805 were discharged cured, 3,177 were invalided, and 394 unaccounted, leaving on hand in March, 1814, 29,841 (6,422 sick, 23,419 wounded). During June-August, 1815, 42,092 sick and wounded were treated in 60 military hospitals between Memel and Evreux, of whom 948 died, 29,165 recovered, 626 were invalided, and 60 unaccounted, leaving 11,293 on hand on September 1.

The losses in the principal battles from Austerlitz to Waterloo were:

Austerlitz (December 2, 1805): French, 12,000 killed and wounded out of 94,000; Austrians and Russians, 26,000-30,000 out of 84,000.

Jena-Auerstadt (October 14, 1806): French, 6,000 out of 96,000; Prussians, 12,000 out of 54,000.

Eylau (February 8, 1807): French, 15,000 out of 79,000; Allies, 18,000 out of 74,000.

Friedland (June 14, 1807): French, 12,100 out of 86,000; Russians, 10,000 out of 46,000.

Aspern (May 21-23, 1809): French, 8,000 killed, 24,000 wounded out of 70,000; Austrians, 1,287 killed, 16,213 wounded out of 80,000.

Wagram (July 6, 1809): French, 23,000 killed and wounded, 7,000 missing out of 181,700; Austrians, 19,110 killed and wounded, 6,740 missing out of 128,600.

<sup>31</sup> Goercke: *Kurze Beschreibung der bei der k. preussischen Armee stattfindenden Krankentransportmittel*, Berlin, 1814. For full account of the hospitals, transport, voluntary nursing, etc., see, Bock & Hasenkopf: *op. cit.*, 156-200.

<sup>32</sup> P. Myrdacz: *Das deutsche Militär-Sanitätswesen*, Wien, 1896, 28.

<sup>33</sup> C. Richter: *Allgemeine Chirurgie der Schussverletzungen im Kriege*, Breslau, 1877, 898-940. Frölich: *Ztschr. f. Krankenpfl.*, Berl., 1896, xviii, 89-90. Bock & Hasenkopf: *op. cit.* (Veröffentl. etc.), 1918, xviii, 196).

Smolensk (August 17, 1812): French, 20,000 out of 180,000; Russians, (?) out of 180,000.

Borodino (September 9, 1812): French, 32,000 out of 130,000; Russians, 42,000 out of 121,000.

Gross-Gorschen (May 2, 1813): French, 6,000 killed, 11,000 wounded out of 90,000; Allies, 10,000 killed and wounded out of 54,000.

Bautzen (May 20-21, 1813): French, 5,000 killed, 14,000 wounded out of 150,000; Prussians and Russians, 7,500 killed, 16,000 wounded out of 110,000.

Leipzig (October 16-19, 1813): French, 30,000 out of 145,000; Allies, 60,231 out of 300,000.

Quatre Bras (June 16, 1815): French, 4,300 out of 22,000; Allies, 5,600 out of 33,000.

Ligny (June 18, 1815): French, 8,500 out of 71,000; Prussians, 12,000 out of 84,000.

Waterloo<sup>14</sup> (June 18, 1815): French, 30,000 killed and wounded, 6,000 prisoners out of 72,000; Allies, 21,997 (1,120 officers) out of 120,000. (British 15,000; Prussians 6,000—7,000).

### *The Mexican War* <sup>35</sup>

The Mexican War (1846-48) is highly instructive to Americans as a campaign of small dimensions, entered upon caravan-wise, with boyish, meridional enthusiasm, waged in an unknown country, without forethought or adequate preparation, by an army equipped on a peace footing, and carried to a successful issue, in spite of untold suffering from lack of clothing, supplies, rolling stock and adequate medical administration. At this time, the Regular Army numbered 7,500 and the Medical Department consisted of a Surgeon General, with the rank of colonel, and 71 medical officers, increased by Congressional acts of 1846-7 to 115, with 135 surgeons for volunteer forces (total 250). About 100,000 men were sent to Mexico during 1846-8, so that only 6 companies of regular troops were left in the whole United States (Duncan). The commanding general (Winfield Scott) was a veteran of tried ability, who stands high in the annals of his profession as an officer who consulted freely with his medical staff. He was accompanied by the Surgeon General (Thomas Lawson) in person. The motor power of this campaign was romantic enthusiasm, rather than the "hostile feeling" or the "hostile view" of the military authorities. Under the "hostile view," an armed force (e. g., that of Dewey at Manila) is an impersonal agent of government, executing the will of government, in wars imposed upon a nation by an impersonal "enemy," and it is the duty of the people to maintain such forces in adequate preparedness, to insure against the humiliating consequences of defeat and major losses from battle casualties and disease. The lack of medical preparedness in the Mexican War was no worse than that in the Crimean or Solferino episodes, and was due to the lack of real knowledge of military sanitation at the time. There were no ambulances in the army before 1859. Only 180 mule-drawn wagons were available on April 5, 1847. There were no shelter or hospital tents, hospital equipment, cooking utensils or other conveniences, and marching for months in one uniform, the soldiers were soon barefooted and in rags. Ignorance of the character of water-supplies brought hundreds down with diarrhoea and dysentery; hospitals were hastily improvised in any convenient buildings and the misery of the sick was increased by the squalor of Latin surroundings. Conditions improved after the entry into the Mexican capital, when General Scott levied \$20,000 "for the sick in hospital." Duncan gives the total losses as 1,549 killed and died of wounds, 10,951 died of disease, 13,825 discharged for disability. The heaviest casualties were at Cherubusco (1,074), Molino del Rey (779) and Chapultepec (861). The disease rate was 110 per 1,000, as compared with 65 in the Civil War and 16 in the World

<sup>14</sup> Called by the Prussians "Belle Alliance."

<sup>35</sup> J. H. Porter: *Am. J. M. Sc.*, Phila., 1852, n. s., xiii, 13; xiv, 13; 1853, xiv, 25; xvi, 296; 1858, xxv, 347. L. C. Duncan: *Mil Surgeon*, Wash., 1920, xlvii, 436, 596; 1921, xlvii, 76.

War. The sick-rate from dysentery was high and the disease was widely spread through the home country by the returning troops. Through the Mexican war, the United States acquired Texas, New Mexico and California, for which \$15,000,000 was paid by the government, while the army gained retirement for officers, military rank for medical officers and the Soldiers' Home at Washington.

### *The Crimean War*<sup>26</sup>

Of all recorded wars, the Crimean (1854-55) has perhaps the greatest teaching value for military medicine. For the Western allies, it was fought in a circumscribed area, far distant from the centers of authority and supplies. The English and French commanders soon found themselves hampered by conflict with their home governments as to the conduct of the war, to the utter neglect of proper sanitary and supply service, a condition which well-nigh wrecked the whole enterprise through losses from communicable diseases. The establishment of telegraphic communication between France, England and the Crimea imposed a dreadful incubus upon those in actual contact with the enemy. London and Paris burned the wires with strange administrative orders which blighted the energies of able commanders and all but extinguished the medical service. Canrobert resigned to serve faithfully in a subordinate capacity. His successor, Pelissier, was reduced to impotent fury and Lord Raglan died of worry. The medical officers of the French army were completely subordinated to the *intendances* or civil administration and had no authority beyond that of ordinary civilian practitioners at the bedside. In the British service, the status of battalion and regimental surgeons was virtually the same, although the hospital and ambulance service was officered by the line, with no distant bureaucratic control.

The war lasted from September 14, 1854, to July 12, 1856, and was mainly concentrated on the siege of Sebastopol, the sally-port of the Russian fleet. The assault on the Malakoff and the capture of Sebastopol terminated a drawn contest, which resulted in nothing, and which cost Great Britain \$335,340,000, France \$451,980,000 and Russia \$690,120,000. The total French forces in the Crimea numbered 309,268 men, of whom 500 were medical officers; the English, 97,864, with 448 medical officers; the Russians, 324,478 with 1,608 army surgeons and 3,759 Feldshers; the Sardinian, 21,000, with 88 surgeons; the Turkish 35,000 with no medical personnel whatever. Berndt estimates the total losses from all causes as: Allies, 252,600; Russians, 256,000 and Mulhall gives even larger figures. Myrdacz estimates:

French: 8,250 killed; 39,868 wounded; 4,354 died of wounds; 196,430 sick; 59,815 died of sickness.

<sup>26</sup> Great Britain: Medical and surgical history (etc.), 2 vols. London, 1858. Sir T. Longmore: The Sanitary Contrasts of the British and French Armies during the Crimean War. London, 1883. P. Myrdacz: Sanitäts-Geschichte des Krimkrieges. Wien, 1895. F. H. Garrison: Mil. Surgeon, Wash., 1917, xli, 457-473. For the life of Pirogoff, see his "Lebensfragen" in Bibliothek russischer Denkwürdigkeiten, Stuttgart, J. G. Cotta, 1894, an astonishing mixture of religious mysticism and sagacity.



English: 2,755 killed; 18,283 wounded; 1,847 died of wounds; 144,390 sick; 17,225 died of sickness.

Russians: 21,000 killed; 92,381 wounded; 14,671 died of wounds; 332,097 sick; 37,454 died of sickness.

In other words, the Russians had twice as many killed and wounded as the allies, while the ratio of battle casualties to deaths from disease was 1.4 among the allies, and 1.1 among the Russians. Among the French the mortality from disease was 253.5 per 1,000; that of the English 119.3, that of the Russians 161.3. The Crimean War shows the highest battle losses per thousand (among the Russians) and from disease (among the French) of all the wars in history. These latter were largely due to cholera, typhus fever, dysentery and scurvy. Longmore's computations show that exclusive of cholera, the British losses from disease, during 1854, were 2,373, the French, 1,857, while in 1856, the English lost only 218, the French 17,129 and for the following reasons: The British entered upon the war in a state of unpreparedness, with only 40 ambulance wagons, a pack-mule and 10 litters for each regiment, no winter clothing, no shelter tents and a worthless corps of male nurses, commandeered from the line; while the French had shelter tents, division ambulance companies (field hospitals of 18 tents), abundant supplies and matériel and even fur overcoats. As time wore on, the terrible losses among the British from disease created a great sensation in the press, with the result that Parliament and the public took hold of the situation and sent out clothing, supplies and transport in profusion. At the instance of Sidney Herbert, Florence Nightingale went out with a corps of trained nurses and what she accomplished created modern nursing. The suffering troops were eventually housed in wooden huts with adequate creature comforts. Even the food-supply and cookery were in the hands of the famous *chef*, Alexis Soyer.<sup>37</sup> Meanwhile the French, still under canvas in the severe winters of 1855-6, were worn out with the prolonged exertion of warfare; their mortality and mortality statistics went up as the English went down. Thus the conclusion of the war was an object lesson in the evils resulting from lack of sanitary preparedness and in those resulting from gradual slackening of the eternal vigilance which is necessary to good sanitation. The Russians eventually secured a large corps of trained nurses under the direction of Nikolai Ivanovich Pirogoff (1810-81), a military surgeon of the first rank. In England, the scandals incident to the War resulted in a prolonged investigation, the publication of the first medical and surgical history of a war by government (8 vols., London, 1855-8), and enlarged military authority for British medical officers.

The lesson of the Crimean War is that a central civil administration will do little for the successful conduct of a campaign if it neglects its primal duty of sending all necessary supplies, reinforcements and medical aid to the forces at the front, yet hampers their commanders and medical officers with orders and suggestions based upon academic assumptions and insufficient knowledge of actual conditions at the theatre of war.

### *The Italian Campaign of 1859<sup>38</sup>*

This war, waged for the liberation of Italy from the Austrian yoke, was fought by 70,000 Sardinians under Victor Emanuel II, 128,000 French allies and 230,000 Austrians. In the actions at Montebello (May 20), Palestro (May 31), Melegnano (June 8), and the battles of Magenta (June 4) and Solferino (June 24), the Austrians were defeated. The peace of Villafranca (July 11) ceded Lombardy to Piedmont while Venice was retained by Austria. The Austrian Army had ambulances, field hospitals and sanitary com-

<sup>37</sup> For an account of Soyer's remarkable work, see the interesting article by Capt. J. S. Taylor, U. S. N., in U. S. Naval Med. Bull., Wash., 1921, xv, 139-173, port.

<sup>38</sup> P. Myrdacz, *Sanitäts-Geschichte des Feldzuges 1859 in Italien*. Wien, 1896.

panies, but their medical administration in the field broke down through the fact that the chief surgeons of the two armies were mewed up in general headquarters and not allowed to have access to the field commanders, so that there was no centralized direction for relief of the wounded. In the French army, the chief surgeon, Baron F. X. Larrey, Jr., was under the thumb of the general intendant Paris, the real executive, to whom Larrey could only submit "propositions," with the usual deplorable effects upon field medical administration. The correspondence between Paris and Larrey, published by Chenu, shows how sorely the chief surgeon's patience was tried by this short-coating. The natural sequels of this irritating decentralization came to a head on the bloody field of Solferino, where the *débâcle* of relief of the wounded was complete and disgraceful. Out of all this came one great good. In 1862, Henri Dunant (1828-1910), an eye-witness of this battle, published "*Un Souvenir de Solferino*," and his account of its horrors led to an International Conference of the Red Cross Societies at Geneva in 1863 and to the Geneva Convention of August 22, 1864, in virtue of which the fourteen signatories pledged their respective nations to regard the sick and wounded, as also the army medical and nursing staffs as neutrals on the battle-field. This Convention was observed all over the world up to the European War.

### *The Civil War*<sup>39</sup>

Lynch has defined the period 1865-98 as "the day of small things in the United States Army." In the period 1800-61, there was but little advance made in medical administration over the methods used in the Revolution, when, as Hoff says, "all that our people knew of military affairs came from the British." The policy followed at the conclusion of each war was the then current English plan of cutting down the Army and Medical Corps to an irreducible minimum. During this period, our small army was distributed in small commands, stationed at isolated and widely scattered posts, at which the business of the medical officer was confined to routine duties and practice at the post or among the civilian population. The effect was sometimes to produce the enslaved or discontinuous mind, the habit of thinking in petty terms, of interpreting the letter rather than the spirit of Regulations. The Civil War found the government unprepared, with the necessity of beginning a gigantic contest with undisciplined, inexperienced volunteers, and with many of the fine flower of the West Pointers gone over to the South. The earlier failures of the Union forces were obviously due to incompetent, dilatory generalship and to narrow adherence to worn-out routine in the central administration. In the eyes of foreign military authorities, the Civil War has little teaching value, except as demonstrating that armies voluntarily enlisted for a war period, "while capable of unexcelled feats of endurance" are "incapable of forcing a swift decision," an alternative which usually

<sup>39</sup> United States, War Department, Surgeon General's Office. Medical and Surgical History of the War of the Rebellion. 6 vols. Washington, 1870-88. L. C. Duncan: The Medical Department of the United States Army during the Civil War, Washington, 1914.

proves an expensive luxury, as far as the lives and financial resources of tax-payers are concerned.<sup>40</sup>

*Letterman*

Given the size of the armies raised, the medical arrangements for evacuation and care of the wounded were meagre. There was no organized ambulance or field hospital service, no organization for evacuation to the interior, where hospital service was hastily improvised in hotels, barns and neighboring private houses. The introduction of rifled arms, with fixed ammunition and conoidal bullets, had vastly increased the range and rapidity of fire, with much wider danger-zones and greater scattering of the wounded over the field. As the engagements increased in magnitude, the wounded lay helpless on the battle-fields for hours extending to days, before the slow work of evacuation was completed. Duncan relates that, on two occasions, evacuation to Washington was attempted by commandeering 100 rickety hacks and hucksters' wagons from that city.<sup>41</sup> The teamsters driving army wagons were drunken, insolent and insubordinate. There was no effective bridge in the way of sanitary formations operating between front and base to relieve commands overwhelmed with casualties. This not only caused immense suffering and losses among the wounded, but interfered with the mobility of fighting units, through delays and stalling of vehicles, sometimes demoralized commands as to fighting capacity, and encouraged skulkers to desert the lines under pretext of assisting the wounded to the rear. All this was changed by the advent of Jonathan Letterman (1824-72), who succeeded Tripler as medical director of the Army of the Potomac on June 19, 1862, and whose genius for medical administration brought about the epoch-making reforms which became a pattern for all subsequent armies and eventually fixed principles in our own.<sup>42</sup> In his capacity for thinking in large terms, Letterman was very adequately encouraged by his military chiefs, McClellan and Hammond, whose letter of June 19 commits to him "the health, the comfort and the lives of thousands of our fellow-soldiers."

On August 2, 1862, Letterman's plan for an Ambulance Corps was at once put into effect in the field by McClellan's General Orders of that date, further amplified in G. O. of August 24, approved by Hammond (September 7), adopted by Grant in the West (G. O. March 30, 1863) and, although disapproved by Halleck and Stanton, eventually incorporated by Congress in the Act of March 11, 1865. It provided for an ambulance corps for each army corps, with two-horse vehicles provided with 2 litters each, in the

<sup>40</sup> Atkinson: *op. cit.*, 603; 623.

<sup>41</sup> Duncan: *op. cit.*, 34; 36-38; 43.

<sup>42</sup> Letterman: *Medical Recollections of the Army of the Potomac*. New York, 1866. *Medical and Surgical History of the War of the Rebellion*. Surg. vol. pt. iii, Washington, 1883, 923-986.

proportion of 3 for each regiment of 500. The corps was officered by a captain as commandant, with 1 lieutenant for each division or brigade, 1 sergeant for each regiment, 2 privates and 1 driver to each ambulance and 1 driver to each medicine wagon. The personnel, detailed from the line to secure well-disciplined men at the start, was under sole control of the medical director; provisions for drill of the corps, parking and disposition of the vehicles in the train were made and use of the ambulances for any other purpose than evacuation was forbidden. Letterman's system was first tried out at the battle of Antietam (September 17, 1863), and here, as medical director of an army of 100,000, he was able to demonstrate its worth in the face of great difficulties in obtaining ambulances, equipment and supplies. At the first Bull Run, one-half (550) of the 1,100 Union wounded had been sent to Richmond as prisoners, the rest reaching the lines at Arlington on foot or in vehicles as best they could. At Cedar Mountain, some of the 1,445 wounded remained on the field for 36 hours, at Manassas, the wounded remained on the field all night before evacuation. On the march to Antietam, Letterman had collected supplies and some 300 ambulances four days before, and although the battle line was 6 miles long and the number of wounded 10,000, all had been collected and sheltered inside of 24 hours. Soon after Antietam, Letterman attacked the problem of supplies, which under the old regimental system of distribution, were either in excess of requirements or deficient, and in the former case, came to be recklessly wasted when their bulk made them impedimenta on a march or in retreat. In his circular (with supply-table) of October, 4, 1862 (revised September 3, 1863), Letterman changed all this by an economic selection of the amounts of different medicines and matériel to be transported and thus reduced the number of supply wagons by nearly one-half. Under the old system, there were stationary regimental (tent) hospitals and base hospitals improvised in large buildings in interior towns. Letterman's Circular of October 30, 1862, introduced his third great improvement in medical administration, viz., mobile field hospitals, consisting of tents and equipment, manned by appropriate medical and surgical personnel, for receiving and treating the wounded evacuated from the lines, prior to ultimate evacuation to base. With the aid of these hospitals and the ambulance companies, the great gap between front and base was bridged, and it became possible to relieve and treat the wounded during battle. Letterman's ambulance organization continued to gain in efficiency in such major battles as Fredericksburg, Gettysburg and Chickamauga but his completed system was not in full swing until the beginning of Grant's and Sherman's campaigns of 1864, in which it reached its height of perfection. The 200 ambulances constructed early in 1861, before Letterman's detail, were light two-wheeled carts, of the old Larrey type, which gave the wounded intolerable discomfort by their rocking motions and were soon displaced by capacious four-wheelers of varied type. The litters employed were of canvas stretched across two poles. Freight and passenger cars were converted into hospital cars, with three stories of berths on either side. Steamboats and steamships were employed for water transportation. The base hospitals, both Union and Confederate, were at first located in adjacent hotels, churches, factories, warehouses, schools, academies and private dwellings, e. g., the National Hotel, Georgetown College and Odd Fellows Hall, D. C. (1861), or the Tishomingo Hotel (Corinth, Miss.). As the wounded poured in from the great battles, additional wards were constructed around these buildings as nuclei and finally separate groups of ridge-ventilated wooden pavillions were constructed, of one story each, arranged in geometric figures around a central administration building and connected by covered passageways, the originals of our base hospitals in the recent war. The first of these was the large wooden structure erected at Parkersburg, Va. (1862). Some of them, such as the Satterlee (West Philadelphia) of the Mower at Chestnut Hill, had over 3,000 bed capacity.<sup>43</sup> In these advances in ambulance and supply service and

hospitalization, much was due to the propagandism of the Sanitary Commission (organized June 9, 1861) and the Christian Commission. Although these organizations were inclined to magnify and overestimate their importance, they were undoubtedly the main sources of food, medicines, clothing and other much needed supplies during the early period of the war. A questionnaire for hospital inspectors had been devised by Tripler, but the Sanitary Commission was also instrumental in forwarding sanitary inspection of camps and hospitals. In 1864, the medical organization included divisional medical directors and medical inspectors, chief surgeons of divisions, brigades and division hospitals, divisional attending surgeons, regimental assistant surgeons, and commanders of divisional and brigade ambulance companies.<sup>44</sup> Acting assistant or contract surgeons were employed for special duties, and among the volunteer medical personnel, many of these were detailed on part-time service, continuing practice in their home cities. Hammond's Circular of May 21, 1862 (No. 2 S. G. O.), ordered more exacted and detailed reports of the sick and wounded and the diligent collection of pathological specimens, projectiles, etc., from the battlefields, resulting in the foundation of the Army Medical Museum (August 1, 1862). Hammond also projected an Army Medical School but this was discouraged by Stanton. The Medical and Surgical History of the War, adumbrated in Hammond's circular of May 21, 1862, and edited up to 1884 by Joseph J. Woodward and Charles O. Otis, was completed after Woodward's death by Otis, Charles Smart and David L. Huntington, and published, in six massive volumes, during 1870-88. This work received at once the high commendation of Virchow and other European authorities and was undoubtedly the most important contribution to military medicine and surgery yet made. The medical statistics of the war were not published in the Surgeon General's Annual Reports during 1861-2, but in the history of the war, which contains the records of the brilliant work done in the medical conduct of the war by Letterman, McParlin, Woodward, Otis, Billings, Woodhull and others.

### *Battle Losses in the Civil War*

The losses among the Union forces were 44,238 killed in battle, 49,731 died of wounds, 186,216 died of disease, 24,184 died of unknown causes (total, 304,369). A later A. G. O. estimate gives 67,058 killed, 43,012 died of wounds, 224,586 diseases, and 24,942 unknown causes (total, 359,598). It was estimated by Dr. Joseph Jones that the Confederate Army lost about 25,000 from battle wounds and 175,000 from disease. The killed, wounded and missing on both sides in all the battles and engagements from April 12, 1861, to May 26, 1865, are given in the Surgical Volume (Part I) of the Medical and Surgical History of the War (1870), pp. XXXIV—CXL.

The losses in the principal battles were:

Bull Run (July 21, 1861): Union, 481 killed, 1,011 wounded and 1,460 missing; Confederate, 269 killed, 1,483 wounded.

Seven days before Richmond (June 26th to July 1, 1862): Union, 1,582 killed, 7,709 wounded and 5,958 missing; Confederate, 2,820 killed, 14,011 wounded and 752 missing.

Cedar Mountain (Aug. 9, 1862): Union, 450 killed; 660 wounded, and 290 missing; Confederate, 229 killed, 1,047 wounded and 31 missing.

Bull Run (2d) (Aug. 30, 1862): Union, 800 killed, 4,000 wounded and 3,000 missing; Confederate, 700 killed, 3,000 wounded.

Antietam (Sept. 17, 1862): Union, 2,010 killed, 9,416 wounded and 1,043 missing; Confederate, 3,500 killed, 16,399 wounded and 6,000 missing.

<sup>43</sup> For the hospitals, see *Med. & Surg. Hist. (etc.) Med. vol. pt. iii, Wash., 1888, 896-966.*

<sup>44</sup> For the duties of these officers in campaign, see, *Med. & Surg. Hist. (etc.) Surg. Vol. pt. iii, Wash., 1883, 899-914.*

Fredericksburg (Dec. 13, 1862): Union, 1,180 killed, 9,028 wounded and 2,145 missing; Confederate, 579 killed, 3,870 wounded and 127 missing.

Chancellorsville (May 1-4, 1863): Union, 1,512 killed, 9,518 wounded and 5,000 missing; Confederate, 1,581 killed, 8,700 wounded and 2,000 missing.

Gettysburg (July 1-3, 1863): Union, 2,834 killed, 13,709 wounded and 6,643 missing; Confederate, 3,500 killed, 14,500 wounded and 13,621 missing.

Wilderness (May 5-7, 1864): Union, 3,288 killed, 9,278 wounded and 6,784 missing; Confederate, 2,000 killed, 6,000 wounded and 3,400 missing.

Cold Harbor (June 1-12, 1864): Union, 1,905 killed, 10,570 wounded and 2,456 missing; Confederate, 1,200 wounded and 500 missing.

Kenesaw Mountain (June 9-30, 1864): Union, 1,370 killed, 6,500 wounded and 800 missing; Confederate, 110 killed and wounded, 3,500 missing.

Petersburg (June 15-19, 1864): Union, 1,298 killed, 7,474 wounded and 1,814 missing.

Atlanta (Hood's first sortie) (July 22, 1864): Union, 500 killed, 2,141 wounded and 1,000 missing; Confederate, 2,482 killed, 4,000 wounded and 2,017 missing.

### *The Seven Weeks War*<sup>45</sup>

In the Seven Weeks War (1866), the advantages of breech-loading over muzzle-loading weapons were demonstrated for the first time. The Austrian Army of the North, numbering 328,168 men, was armed with old-fashioned muzzle-loading rifled artillery carrying the case-shot (shrapnel) of the Napoleonic wars. The Prussian army confronting them, numbering 302,134, was armed with breech-loading rifled cannon and with breech-loading needle guns, sighted to 400 yards. But although the Austrians were esteemed superior to their adversaries, their troops had to load standing up, which gave their opponents a distinct advantage while the Prussians were superior in physique, training and general staff work. The Austrians were easily picked off by the long range rifles of the enemy, who could now creep up inside the artillery range and fire lying down, thus nullifying the effect of case-shot. In the battles of June 26-July 22, the Austrians lost 10,070 killed, 29,675 wounded, 13,330 missing, the Prussians, 3,439 killed, 12,491 wounded, 702 missing. Cholera, typhus fever and dysentery were very prevalent at this time and were spread through Prussia, Saxony, Bohemia and Moravia by the invading army. The Prussians had 64,191 sick, of whom 5,219 died, 39,258 were discharged and 19,714 remained in hospital. This condition occasioned a sharp critique of the Prussian sanitary administration by army surgeon, G. F. F. Loeffler, the historian of the war (1868).<sup>46</sup> Loeffler pointed out that the mortality of 10½ per cent among the wounded in the different battles and of 11½ per cent at Königgratz, as also the sick lists, while an improvement on the past, were a measure of sanitary inefficiency. Meanwhile, in consequence of these conditions, the king called a conference of the leading military surgeons of Prussia, which lasted from March 18 to May 5, 1867, and resulted in a complete reorganization of the medical service of the Prussian Army, including the expansion of voluntary first aid, in accordance with the Geneva Convention of August 22, 1864.

### *The Franco-Prussian War*<sup>47</sup>

In this war, the most remarkable example in recent times of a campaign adroitly motivated, suddenly precipitated and brought to a

<sup>45</sup> P. Myrdacz: *Sanitäts-Geschichte der Feldzüge 1861 und 1866*. Wien, 1897. F. H. Garrison: *Mil. Surgeon*, Wash., 1917, xli, 711-717.

<sup>46</sup> F. Loeffler: *Das preussische Militär-Sanitätswesen und seine Reform nach der Kriegeserfahrung von 1866*. Berlin, 1868.

<sup>47</sup> P. Myrdacz & J. Steiner: *Sanitäts-Geschichte des deutsch-französischen Krieges 1870-71*. Wien, 1896.

speedy conclusion by "short, sharp and decisive" action, the Prussians profited by the lessons learned in 1866. They entered upon the campaign fully prepared, mobilized their entire forces in 8 days (July 16-24, 1870) and concluded the war in five months, on January 28, 1871. There is no question that the French labored under the disadvantages of inferior leadership, poor training, faulty equipment, and the cumbersome methods of their bureaucracy.

During the war, the French forces were increased from 244,828 to 534,000 (total mobilization 800,000), the German from 384,000 to a mean strength of 788,213 (total mobilization 1,113,700). The French medical organization was that of 1854-9; the total number of medical officers being 1,020 or 127 less than required in the cadre. The directors of administration in the field were the *médecin inspecteur* (for the whole army) and a *médecin principal* for each army corps. Each army corps and each division had its own ambulance service, manned by 4-5 physicians and 20 nurses, with wagons and animals, but no litter-bearers. Evacuation of the wounded was assigned usually to troops detailed from the line. First aid stations were manned by the battalion physician and bandagers behind the firing lines. Division ambulances were posted 4 km. beyond, corps ambulances further back, transportation being effected with the ambulances on hand and by other vehicles available. The Prussians had a much larger medical personnel, viz., 3,853 medical officers, eventually raised to 5,548 from civil life, 5,858 hospital attendants, 2,921 nurses, 468 apothecaries.

The medical administration in the Prussian War Department was directed by the Surgeon General (H. G. Grimm). The cadre of the field formations included a chief surgeon for each army, corps surgeons for the separate corps, division surgeons, regimental surgeons, battalion surgeons, with chief staff surgeons, staff surgeons and assistant surgeons for the cavalry and artillery. Each mobile army corps had a surgical consultant, 3 sanitary detachments manned by 2 staff surgeons, 5 assistant surgeons and 124 litter bearers, and 12 field hospitals (officered by a staff surgeon and 3 assistant surgeons). The Saxon, Bavarian, Württemberg and Baden army corps had similar cadres. The lessons taught by Larrey and Letterman had been well learned. The mobile sanitary formations of these armies were as follows:

North German Confederation: 43 sanitary detachments, 170 field hospitals, 45 sections reserve hospital personnel, 16 hospital reserve depots.

Bavaria: 4 sanitary companies, 12 receiving field hospitals, 4 main field hospitals.

Württemberg: 4 field sanitary trains, 6 field hospitals, 1 hospital reserve depot.

Baden: 1 sanitary detachment, 5 field hospitals, 2 sections reserve hospital personnel, 1 hospital reserve depot.

Evacuation of the wounded was managed as follows: The officers led the litter bearer companies into the battle lines in two detachments consisting each of 5 patrols, and 3 litters each manned by 4 bearers (2 alternates for long distance evacuation). The wounded were collected, given first aid and refreshments where possible, and rapidly conveyed to the ambulances, assembled at nearby stations, which carried them to the main dressing-station, whence they were taken to the field hospitals by ambulances belonging to other detachments or any available vehicles. When the ambulances near the firing lines were in motion to and fro, the litter-bearers conveyed the wounded directly to the main dressing station, whence the slightly wounded proceeded on foot to the field hospitals. The severely wounded were then sent to evacuation hospitals (*Etappenlazarette*), and thence to the base or barrack hospitals, which usually had to be built, as only 162 tents were available in the Prussian Army. The large general hospitals in the cities were sometimes quadrangu-

lar and sometimes V-shaped (as at Hamburg [Altona] and Mannheim) or M-shaped (as on the Tempelhof in Berlin), with the administration and other buildings in a perpendicular line let fall from the central angle. There was a large organization for voluntary nursing in the cities, patronized by the élite. The French arrangements for evacuation in the field followed the modern lines, but were deficient in personnel and matériel, while there had been no preparation for hospitalization in the interior. Assistance to the wounded in the cities was eked out by charity of the public spirited and by voluntary nursing organizations. There were also volunteer sanitary formations in the field, such as the Anglo-American Ambulance organized by the American gynecologist Marion Sims. The German hospitals in the zone of advance handled 468,487 sick and 92,164 wounded and of these about 250,000 were evacuated to the interior. Chenu computes that the French had 131,000 wounded and 339,421 sick (total 609,961), of whom there were 136,540 killed, missing and died from wounds and disease. The Germans had 116,826 killed and wounded out of 788,213 mean strength (148.2 per 1,000) and of these 17,255 were killed and 11,023 died of wounds. Some 475,000 sick were admitted to hospital, of whom 14,904 eventually died. This was, therefore, the first war of magnitude in which the mortality from battle casualties (among the Germans) exceeded that from disease. The most fatal communicable diseases were typhus and typhoid fevers, smallpox, and dysentery. This campaign afforded a scientific proof of the value of Jennerian vaccination. Among the German troops, who had been vaccinated and revaccinated, the smallpox incidence was 4,835 cases, with 278 deaths; among the French prisoners, only part of whom had been vaccinated, it was 14,178 cases, with 1,963 deaths. An elaborate official history of the Prussian Army medical department in the war was published in 1884-90.<sup>48</sup>

The losses in the different battles were:<sup>49</sup>

Würth (August 6, 1870): French, 17,000 killed, wounded and missing out of 50,000; Germans, 10,643 out of 120,000.

Spicheren (August 16): French, 3,976; Germans, 4,872.

Colombey (Borny) (August 4): French, 3,608 out of 84,000; Germans, 4,907 out of 57,000.

Vionville (Mars la Tour) (August 16): French, 17,231 out of 113,000; Germans, 15,800 out of 63,000.

Gravelotte (August 18): French, 12,275 out of 140,000; Germans, 20,173 out of 188,000.

Beaumont (August 30): French 4,800; Germans, 5,534.

Sedan (September 1): French, 14,000 out of 120,000; Germans, 8,931 out of 220,000.

Noisseville (September 1): French, 3,542; Germans, 2,978.

### *The Russo-Turkish War (1877-78)*<sup>50</sup>

This war (1877-78) is of interest as establishing the value of intrenchments and field works in securing invisibility against artillery fire. The spade was freely used on both sides as the Turks were armed with Krupp breech-loaders (artillery), Martini rifles (infantry) and Winchester earbines (cavalry). The Turks were better armed and proved to be better fighters, but they had no such generals as Skobelev and Todleben, and their commanders were overridden by their politicians at Constantinople "with the disasters which invariably follow the attempt of civilian amateurs to control warlike operations" (Crowe). The only decisive battles were the Russian defeats at Plevna (1877), with Russian losses

<sup>48</sup> Germany: *Kriegsministerium, Sanitäts-Bericht über die deutschen Heere im Kriege gegen Frankreich 1870-71*. 7 vol. in 11 pts. Berlin, 1884-90.

<sup>49</sup> Myrdacz. *op. cit.*, *passim*.

<sup>50</sup> P. Myrdacz: *Sanitäts-Geschichte des russisch-türkischen Krieges 1877-78*. Wien, 1898.



of 2,898 and 7,338 on July 20 and 30, the fall of Plevna and the Turkish rout at Philipopolis (1878). In the Turkish army of 363,000 men, there was no organization for evacuation of the wounded, who were taken out of the lines by comrades. The Russians had an organized medical corps, ambulances and litter-bearers, "temporary war (field) hospitals," troop and division hospitals, retreats for the light sick and slightly wounded (*okolotki*) and large general hospitals in the cities of the interior helped out by the voluntary nursing organization of the Russian Red Cross; but their losses from typhus, dysentery and battle casualties were heavy, viz:

Army of the Danube (592,085 men): 11,905 killed, 43,386 wounded, 4,955 died of wounds; admissions to hospital, 951,993; died of disease, 50,464; deaths from typhus and typhoid, 23,752 out of 135,239 cases; deaths from dysentery, 9,543 out of 43,386 cases.

Army of the Caucasus (mean strength 246,454): 13,266 wounded; 1,869 died of wounds; admissions to hospital, 1,198,023; died of disease, 34,877; deaths from typhus and typhoid, 20,233 out of 64,298 cases; deaths from dysentery, 3,552 out of 22,984 cases.

### *Military Surgery in the 19th Century*<sup>51</sup>

The wars of the 19th century drew into the military service some of the greatest surgeons of the period. Larrey, Percy, Hennen, Guthrie, Dieffenbach, the elder Langenbeck and the elder Graefe served in the Napoleonic Wars, of which Larrey's "*Mémoires de médecine militaire*" (1812-17) is the most enduring surgical memorial. Sir Charles Bell attended the wounded after Corunna and Waterloo; Dupuytren those from the July Revolution of 1830. John Hennen's surgical treatise of 1818 is a valuable surgical record of the Napoleonic period. Blandin rendered service in Algeria, Velpeau and Jobert de Lamballe looked after the casualties of the February Revolution of 1848. Esmarch and Stromeyer served in the campaigns of 1849-51, 1864-6 and 1870. The great name of Pirogoff is associated with the Crimean and Russo-Turkish Wars. W. W. Keen, Otis, Billings and Hunter McGuire were prominent in the Civil War. Bilroth, Langenbeck, jr., Volkmann, Esmarch, Gurlt, von Bergmann, Bardeleben, Wilms, Czerny, Nussbaum, and the elder Loeffler served in the Franco-Prussian War.

The military surgery of the century underwent profound changes in consequence of the introduction of ether and chloroform anesthesia (1847), surgical antiseptics (1867) and the many improvements in weapons and missiles. The great discovery of Röntgen (1895) was already to prove its worth in the Spanish-American War (1898-9). Ether was immediately taken up by Pirogoff and Syme (1847) and in the same year it was also employed in the Mexican War. The supreme advantage conferred upon the military surgeon by anesthesia was not merely in the banishment of pain, the disconcerting cries and struggles of the patient, but in the complete abolition of slap-dash operating. Under the older conditions, the patient had to be held by several persons, fortified by stimulants and moral encouragement, or even stupefied by opiates to the limit of tolerance, as in the case of Astley Cooper's attempt to tie the subclavian (1809).<sup>52</sup> Brilliant surgeons like Fergusson, Pirogoff or the elder Langenbeck became sleight-of-hand operators, whisking off a limb before the patient realized it. With the aid of anesthesia, the operator in the

<sup>51</sup> For the history of modern military surgery, see E. Richter: *Allgemeine Chirurgie der Schussverletzungen im Kriege*, Breslau, 1877 (with admirable sections on the history of military medicine in fine print). Also, Bock & Hasenkampf: *Veröffentl. a. d. Geb. d. Mil.-San.-Wesens*, Berl., Heft 18, 1901, 45-155; Heft 24, 1904, 1-178; Heft 27, 1904, 43-385.

<sup>52</sup> Described by Valentine Mott in: *Med. Repository*, N. Y., 1809-10, xiii, 331-334. It is highly probable that opiates were administered before 1847 in more major operations than we know of. The advantages in ligation of the larger arteries or in any operation in which a ship of the surgeon's hand might end the struggling patient's life, are self-evident.

field could proceed with the same careful, deliberate precision as in his own clinic, and in consequence, almost any regional surgery could now be attempted, except in the dangerous hollow cavities. But on the battlefield and in hospital sepsis, wound infection, gangrene, tetanus and erysipelas still proved the bane of surgery and occasioned a dreadful mortality in wartime. The discoveries of Pasteur and Lister (1867) created the newer surgery. At the outbreak of the Franco-Prussian War, the military applications of antiseptics were set forth by Lister himself, in his paper of 1870,<sup>53</sup> and the end of the war (1871) saw his method firmly established in the field by Volkmann, Mikulicz, Thiersch and others. Lister's tour through Germany in 1875 was in the nature of a triumphal progress. The introduction of steam sterilization of instruments (1886) and of general asepsis (1891) by Ernst von Bergmann added the copingstone to the edifice. The stethoscope (1819), the hypodermic syringe, of which various types had been invented by F. Rynd (1845), C. G. Pravaz (1851) and A. Wood (1855), and the clinical thermometer, although known, were regarded as clinical curiosities and did not become a part of general hospital and military practice until about 1866-70. Billings was one of the few medical officers who had a hypodermic kit in the Civil War. It was during the last three decades of the 19th century, in fact, that medical and surgical practice began to acquire something of a scientific status. After 1885, small firearms began to diminish in weight, length and caliber of barrel, magazine or rapid fire guns were substituted for the single loader, and in consequence, smokeless powder came into use to prevent fouling of the barrel from rapidly repeated discharges. To adapt soft leaden bullets to the rifling in rapid firing at high velocity, it became necessary to jacket the leaden core with some smoother, harder metal, while at the same time, to attain a high velocity and to overcome resistance, the projectile was decreased in caliber and weight and increased in length. Weapons were produced which could deliver 40 shots a minute at a range of 4,000 yards, with missiles of extraordinary penetrating power, while improvements in sighting made for uncanny marksmanship. Thus a new kind of warfare was introduced, with projectiles which, at long range, either killed outright or if not attaining a vital spot, produced a small clean-cut wound with little shock and greater chance of recovery. The old larger calibre bullet, with larger wounds and greater shock, was more effective in stopping charges at a certain range. In cases of fracture of the long bones, the small calibre bullet is capable of producing terrible laceration of the soft parts and extensive splintering, simple perforations of flat bones or empty hollow viscera and the usual explosive effects in the brain or the filled stomach. All this led to experimental studies of wounds by small-calibre projectiles, the relatively benign nature of which had been pointed out by Verneuil in 1867. But in 1902, La Garde demonstrated that pathogenic organisms in powder or on bullets are not destroyed by the heat of firing, so that, as the European War proved, we can no longer rely upon the theory of sterile gunshot wounds. They are not "poisoned" as those before Paré thought, but usually infected. Until the days of trench-warfare, operative surgery on the front line was virtually banished from the battlefield. The changes rung upon treatment of gunshot wounds and fractures in the light of studies of the newer projectiles, the newer orthopedics, from Delpech and Stromeyer to Thomas, Sayre and Hoffa, the military surgery of the nervous system, the chest, the viscera, the genito-urinary system, constitute a field too vast for exposition here. Wound-incision known to Paré, was converted by Larrey into wound excision (*débridement préentif*), as we now know it. After his time, it fell into abeyance until the European War. The revival of routine and sometimes reckless amputation necessitated the invention of many new varieties of orthopedic appliances and artificial limbs.

<sup>53</sup>Lister: Brit. Med. Jour., London, 1870, ii, 243.

*Military Sanitation in the 19th Century*

Of medicine, Napoleon said contemptuously "Water, air and cleanliness are the chief articles in my pharmacopœia." This rule-of-thumb hygiene, based upon folk-intuition and cult-cleanliness, was all that could be had before the time of Pasteur and Koch. The Romans drained swamps without knowing why, and the spirit that informed Charles White's midwifery treatise of 1773 could not make obstetric procedure aseptic, except perhaps in his own practice. To go beyond the excellent rules of military hygiene laid down by Pringle (1752) and Brocklesby (1764), something more was needed, something not to be found in the excellent treatise of E. A. Parkes (1864) written at the instance of Sidney Herbert, nor in Pettenkofer's experimental data upon air, water, the soil, etc., upon which such treatises were usually based. The new stimulus came from the data of bacteriology, which, as Flexner said, "transformed hygiene from an empirical art into an experimental science." In the middle period, prior to the foundation of Koch's Institute for Infectious Diseases (1891) in Berlin, some clever things were done. John Snow, who checked the spread of water-borne cholera in London by taking off the handle of the Broad Street pump (1854) and William Budd, who stopped the rinderpest of 1866 "with a poleaxe and a pit of quicklime" both knew how to prevent epidemics and William Farr had already evolved curves from which their course might be predicted (1840-66); but the real change came with the application of Koch's ideas in stopping water-borne cholera at Hamburg by proper filtration (1892-3). This was the starting point of the newer preventive medicine, in which to ascertain the mode of transmission of a disease is more important than to discover its cause, and in which we no longer wait for the disease to occur but attack its transmitting agents beforehand. This did not become apparent until long after Manson's discovery of the mosquito as a vector of *Filaria* (1879) and Laveran's discovery of the parasite of malarial fever (1880). It was the demonstration of the malarial parasite in the mosquito by Sir Ronald Ross (1897-8) which established the theory of insect-borne diseases in practical sanitation. The brilliant results in mosquito-control obtained by Ross in Africa (1899-1902) and by Gorgas in Havana (1901) and Panama (1904-13) made this method a fixed procedure in military hygiene. The discovery of immune human carriers in typhoidal and other infections revolutionized the whole science of disease prevention. The carrier, the contact and the suspect now became more dangerous to the community than the disease itself, and it was perceived that there can be no real prophylaxis in venereal diseases without control of the

male as well as the female carrier. Meanwhile, in consequence of the scientific development of food chemistry, metabolism, heating, ventilation and disinfection, the enlisted man's ration, housing and hospitalization came to be studied from a more enlightened point of view. The exhibits of 19th century uniforms at the Dresden Hygienic Exposition, 1911, showed how long the soldier continued to be made miserable by the heavy shakos, helmets, tight collars and burdensome equipment and weapons of the past.

*Prostitution and Venereal Diseases*<sup>54</sup>

It was from the data of bacteriology and parasitology that the sanitarian began to get his first glimmerings of the real social significance of venereal infections, as opposed to the older theological concept, but he was not destined to see the venereal carrier as he saw the carriers of phthisis, dysentery or influenza until the time of Schaudinn, Wassermann and Ehrlich (1905-10). Meanwhile, the management of venery and venereal infection in armies continued along conventional lines, with the new device of virtual conscription of prostitutes by police control. The Roman and German plan of forestalling infection from promiscuity by domesticating soldiers' wives in regiments (the analogue of the safe and secret societies for intersexual relations which existed among the aristocracy before the Revolution) broke down under the newer doctrines of the political equality of all men and women before the law and the dignity of industrialism. A Prussian Regulation of August 8, 1835, directs all civil and military physicians to report infected prostitutes to police headquarters for purposes of control. A Cabinet Order of 1844 ordered all brothels in Berlin to be closed by January 1, 1846, but the only result was to multiply novel methods of clandestine prostitution among the civil population, so that the number of syphilitics in 1846-7 was greater than in 1844-5. The brothels were reopened in 1851, under police control, to be closed again in 1856. The only new feature in subsequent regulations was "restriction of relations of the military with the civilian population" (order of January 27, 1907). In France, events took about the same course. Napoleon patronized "control" in his usual superficial way, e. g., in his "magnificent gesture" to Bernadotte: "*Je vous félicite sur votre règlement sur les femmes. C'est un abus à proscrire.*" In the Regulations of the port of Brest (1830), soldiers were ordered to report all known infected women. A Belgian order of 1842 even authorized punishment of soldiers withholding the names of such women. Closure of brothels in garrison towns was sometimes circumvented by the threats of commanding

<sup>54</sup> Haberland: *Zschr. f. Bekämpf. d. Geschlechtskr.*, Leipz., 1915, XV, 332-358.

officers to have their troops removed. The military portion of Parent-Duchatelet's great report on prostitution in the city of Paris (3d edition 1857)<sup>55</sup> is the only close analysis of causes and effects and should be read by all medical officers, on account of its freedom from cant, its statement of things as they are, and its robust common sense. During the Civil War, medical (as differentiated from police) control was introduced with such entire success at Nashville and Memphis that, as Surgeon Robert Fletcher reported,<sup>56</sup> the women became "earnest advocates of a system which protects their health and delivers them from the extortions of quacks and charlatans." In England, the Contagious Diseases Act of June 11, 1866, required every public prostitute at a naval or military station to be examined in a dispensary, and if infected, to be placed in a government hospital for treatment. This Act, obviously fair and scientific in intention, was shown to have had a remarkable effect in lowering the rates of venereal infection during the 17 years of its operation, since, in the military scheme of things, it became possible to control both male and female carriers; but due to the peculiar bias of Anglo-Saxon sentiment, it was abolished in the House of Commons on motion of Mr. Stansfeld, on April 21, 1883. Thereafter, the only course open to the military authorities was the hypocrisy of apparent compliance with public opinion set off by occasional recourse to such measures as had undoubtedly been employed before the passage of the Act and had led to its formulation. Meanwhile, Darwinism and other phases of biological doctrine had tended to strip away the garments of pious make-believe from many aspects of the nature of man, particularly normal sexuality; while at the same time, a prominent effect of this novel reasoning was to break down the restrictions upon which social morality is based and the religious sanction which had given it emotional force in the past. Since morality is only an inhibition at best, it came to be regarded as admirable that people should "struggle" for their existence and he who did not display strenuosity in attempting to outdo and belittle his neighbor was rated as a weakling. Police control of prostitution (the worst possible kind of control) came to be exploited by the corrupt politicians of cities as a means of graft, and in Eastern Europe, unfortunate and poverty-stricken women were bullied into prostitution by the police or shipped as merchandise to distant ports. There arose the monstrous doctrine that human beings can be bettered from without rather than from within. For the brutalizing effects of this "struggle-for-lifer" theory of existence civilized humanity was to pay a terrible penalty in the episode of the

<sup>55</sup> Parent-Duchatelet: *De la prostitution dans la ville de Paris*. 3. 6d. Paris, 1857, I, 541.

<sup>56</sup> *Med. & Surg. History of the War*. Med. Vol. Pt. III, Wash., 1888, 891-896.

European War, which brought to a striking focus the problem of sexuality and venereal control.

*The Spanish-American War*<sup>57</sup>

The Spanish-American War (1898) was fought mainly upon the sea and the total battle-casualties were slight, viz., in the Navy 1 officer, 17 men killed; in the Army 22 officers, 244 men killed, 275 died from wounds or accidents out of a mean average strength of 235,631. Some 3,450 died of disease, due mainly to an epidemic of typhoid fever among the troops at the camps at Chickamauga and Montauk Point. The military forces in Cuba, Porto Rico and the Philippines accomplished what they set out to do, in good time and without difficulty, but the severe incidence of malarial and yellow fevers among the troops in Cuba necessitated withdrawal of the army from that island, once the main object of the expedition had been accomplished, and the volunteer medical personnel in the American camps was not equal to the task of coping with the typhoid epidemic. This break-down in medical administration was due in part to the meagre equipment and personnel allotted the army on a peace footing, and to the fact that the war was entered upon, after the usual fashion of Anglo-Saxon nations, without previous planning or forethought. The findings of the Dodge Commission appointed by the President to investigate the conduct of the war resulted in certain important changes in the organization of the Medical Department, to which Surgeon General Robert M. O'Reilly (1845-1912) devoted his administration (1902-9) and which were to prove the main factors of success in our medical arrangements for the pan-European War. To understand the significance of these, it is necessary to go back a little.

In the earlier period William Beaumont (1785-1853) performed, in the back-woods of Michigan, those epoch-making experiments on gastric digestion and on dietetic scales (1824-33) which made him the founder of physiology in our country. But, in these early days, our diminutive army was mainly occupied in nursing along and developing the frontier civilization of the great West, that almost unknown phase of its service to which Sir Richard Burton paid sympathetic tribute<sup>58</sup> and which McCaw has eloquently described:<sup>59</sup>

"Our small regular army has never received from our people the credit due for its long and patient work in helping to build up the civilization of the great West. The army has never been a band of idlers, fattening upon the Treasury and waiting for wars that never came. There has never been a time that the army was not actually doing something for the people. The fringe of the civilization of the West grew steadily forward under the shadow of line upon line of little military stations. The plains and hills, where

<sup>57</sup> G. M. Sternberg: *Jour. Am. Med. Ass.*, 1898, xxi, 1356-1360. Also: *Ann. Rep. Surg. Gen. U. S. Army for 1898 and 1899.*

<sup>58</sup> Sir R. Burton: *The City of the Saints*, London, 1861.

<sup>59</sup> W. D. McCaw: *From address delivered at the banquet to Gen. Sternberg, June 3, 1908.*

the Indian sounded his war-whoop and the coyote ranged at will, are now covered by farms and pastures, by cottages and mansions, with a sturdy and prosperous people. When one goes West now for the first time in a palace car and sees the Stars and Stripes floating over many a school-house he can form no idea of the long and perilous journey of former days by stage coach, by wagon train or on horseback, and the comfort that the same flag brought when it was sighted above the little camp or cantonment. Under the protection of the forts grew up humble villages and scattered ranches, dwellings built of mud, of sod, or rough-hewn timber. The army fought for these people when occasion offered (and there was seldom a time when there was not fighting somewhere between the Canadian and Mexican borders), but it made life possible for the settlers in many other ways, and the lonesome post surgeons did their part manfully."

During the administration of the forceful and capable Thomas Lawson (1836-61), military rank was secured for medical officers in 1847, while in 1856, a great advantage was gained through the enlistment of hospital stewards as such. The next Surgeon General, William A. Hammond (1862-4), a man of open mind and big personality, and one of the most eminent physiologists and neurologists of this country, started the Army Medical Museum (1862), urged the foundation of an Army Medical School (1862), fostered the administrative reforms of Letterman in the field, and created special military hospitals for the study of cardiac, pulmonary and nervous diseases, from which came the important work of J. M. Da Costa on irritable heart in soldiers (1862) and of Weir Mitchell, G. R. Morehouse and W. W. Keen on gunshot injuries of nerves (1864). Under Surgeon General Joseph K. Barnes (1864-82), the exclusive control of General Hospitals was vested in the Medical Department. Under General John Moore (1866-90) instruction in first aid was inaugurated (1886) and a Hospital Corps, enlisted solely for duty in the Medical Department was authorized by Congressional Act of March 1, 1887. A new field equipment was acquired under Gen. Charles Sutherland (1890-93). General George M. Sternberg (1893-1902), Surgeon General during the Spanish-American War, and the pioneer bacteriologist of the country, founded the Army Medical School (1893), established bacteriological laboratories at the School and the posts, established a hospital for tuberculosis at Fort Bayard, and created the Army Nursing Corps (1901).

The Dodge Commission recommended *imp'rimis*, a larger quota of commissioned medical officers. As this was dependent upon (highly improbable) increase in the Army itself, General O'Reilly created the Medical Reserve Corps (1908), an expedient probably suggested to him by the corps of medical cadets organized August 3, 1861, to meet the deficiency of medical officers in the Civil War, and in which he had served as a youth. The Medical Reserve Corps was made up of prominent physicians in civil life, who cooperated with the Medical Department in its endeavor to secure personnel of the best type. Meanwhile a year's supply of hospital furniture, equipment and medicines for an army four times the statutory strength was stored in the Medical Supply Depots, so that the Medical Corps was now in position to equip base hospitals and field units for war service more rapidly than their personnel could be brought together. Thus two seed plants for supplies and personnel—the prime desiderata of armies in wartime and the main recommendations of the Dodge Commission—had already been secured prior to our entry into the European War.

Of the achievement of medical officers on the Civil War period, we may mention the pioneer work of J. J. Woodward in photomicrography, of Billings in public hygiene, hospital construction, vital statistics (U. S. Census) and medical bibliography (Index Catalogue), of Woodhull on the exhibition of ipecac in dysentery (1875-6),\* of Weir Mitchell, on peripheral nerve lesions. American neurology came out of the Civil War, and, in the work of Hammond,<sup>60</sup> Mitchell and J. C. Dalton, may be said to have grown up in the Army. Meanwhile, the acquisition of new tropical possessions gave to the Medical Corps an opportunity eagerly grasped and which came to prompt fruition in the shape of new discoveries in the field of tropical medicine. The great impetus given to bacteriological research by Sternberg led to the work of Reed, Carroll, Lazear and Agramonte on the transmission of yellow fever (1900) and the subsequent sanitation of Panama by Gorgas (1904-13) which made the Canal possible. During the typhoid epidemic in the Spanish-American War, fly-transmission was demonstrated by Walter Reed, Victor C. Vaughan and Edward O. Shakespeare (1899). In 1899, Hoff vaccinated the Porto Rican population against small-pox and stamped out leprosy in the island. In 1909 F. F. Russell vaccinated the army against typhoid fever. The work of the Medical Corps in the Philippines is analogous to that of the Indian Medical Service in Hindustan.<sup>61</sup> The Anglo-Indian medical officers did brilliant work in the investigation of tropical diseases (Lind, Murchison, Vandyke Carter, Leonard Rogers), of serpent venoms (Russell, Fayer), of hypnotism (Esdaile), of heat-stroke, and in therapeutics (Waring), surgery (Freyer), ophthalmic surgery (Macnamara, Smith, Elliot) and the anthropology and natural resources of the whole Indian peninsula. In the science of communicable diseases, the Medical Corps of the U. S. Army has to its credit, the pioneer work of Ashford on hookworm infection and tropical sprue, of Craig on malarial fever and the parasitic infections, of Craig and Ashburn on filaria and dengue, of Vedder on the causation of beri beri and the use of emetine in amoebic dysentery, of Chamberlain on hookworm infection and beri beri, of Gentry and Ferenbaugh on Malta fever. On the didactic side, such text books as those of Christie on X-ray diagnosis (1913), La Garde on gunshot wounds (1914), Munson (1911) and Havard (1909) on military hygiene, Straub (1910) and Ford (1918) on medico-military administration and Mason on hospital corps instruction (1912), are only a few indications of the spirit of professional and scientific preparedness which animated and informed the Medical Corps prior to its participation into the European War.

*(To be concluded)*

<sup>60</sup> W. Browning: Sources of Intellectual Power. Osler Anniv. Vol., N. Y., 1919, I, 881.

<sup>61</sup> For an account of which see, F. H. Garrison: Edinb., M. J., 1914, n. s., XII, 425-432.



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## EDITORIAL

### AS TO POISON GAS

During the war the introduction of the use of poisonous chemicals as a matter of offense was a clear breach of faith by the Germans, who had, not once, but twice voted against their use through their representatives at the conferences at the Hague.

Their horrible efficiency gave an added complex to modern conflict, an influence which will probably linger and again become effective in future warfare. In the present interim of comparative peace we are not particularly concerned with them as a war measure. They have, however, come to bother us from an economic standpoint and in a manner which affects the individual taxpayer.

Any investigation of claims for compensation by former soldiers will show a steadily mounting ratio of men who base their disability on the fact that they were gassed while in France. This has gone to such an extent that the official figure in the records of the Surgeon General of the Army for this class of casualty is only a fraction of the number who claim compensation for disability attributed to this cause. While there is a divided opinion as to whether the fact of having been gassed can be the cause of a subsequent disease, notably tuberculosis, the large majority of medical men, and those who have had the most experience with gas cases, is distinctly in opposition to the theory. It may, of course, be quite frankly admitted that there is a possibility, not a probability, that a lung irritant might favor the activation of any dormant process. That it could, *per se*, induce it seems quite irrational

and illogical if we accept the essential theory of germ disease, "*omne rium ex vivo*." Nor does it seem probable that after a comparatively long period, during which tissue repair has taken place, the results of gas inhalation could produce or induce disease. Experience seems to be showing us that we were somewhat hysterical in our first prognosis in regard to injury of this kind: that cases which are not immediately fatal make quite complete and satisfactory recoveries with no chance for sequelae. There are two outstanding reasons for this rush of claims based on this cause. One is that it has come to be a fixed belief in the mind of the layman that gas can and does produce tuberculosis. There is no doubt that the majority of those who seek relief on this ground are sincere in their belief, but it is a matter of no less doubt that they are mistaken in this belief—to the detriment of the taxpayer who, like Jones, must "pay the freight." From the medical side, there is the fact that many diagnoses of tuberculosis are based on X-ray findings. It is true that, in a lung which has been subjected to irritant gas, there will be a varying amount of tissue irritation, even destruction in the graver cases. The repair of this damaged area will of course give birth to certain sclerotic areas which in the skiagram may give a picture analogous to that of pulmonary tuberculosis and still be no more related to it than was Middleton to Moses, and he claimed his descent because he could drop the *iddleton* and add the *oses*.

We are quite apt, all of us, professional and layman alike, to ride a new idea to death, abandoning it only when it is definitely proved to be defunct.

In the text of this issue will be found an extract of a very thorough and exhaustive report made by Lieut. Colonel H. L. Gilchrist, M.C., U. S. A. who was connected with the Gas Service during the war, saw a great deal of this class of casualty in France and is now attached to the Chemical Warfare Service. His views are worth very serious consideration, as are the opinions of others whom he quotes. If it is true, as it certainly seems to be, that tuberculosis is neither caused nor activated by having been gassed some three or four years ago, you and I and the rest of the taxpaying martyrs are going to have our load materially increased by the granting of a large number of disability claims based on this ground.

JAMES ROBB CHURCH.



## BOOK REVIEWS

CHIRURGIE D'URGENCE, par Félix Lejars, Professeur de clinique chirurgicale à la Faculté de Médecine de Paris, Chirurgien de l'hôpital Sainte Antoine. Un volume grand in-8 de 1120 pages avec 1100 figures et 20 planches hors texte en deux tons. *Broché* sous couverture forte, 75 fr. net. Edit. de luxe, *rel. en deux vol.*, toile pleine, fers spéciaux et tirée sur beau papier couché, 90 fr. net.

This is the eighth edition of the Treatise on Urgent Surgery. The book has been published in six foreign languages and, besides, often reprinted. The first edition appeared in 1899. Because of the many changes which the last years have developed, such a book could only be published as new when markedly improved, in order to be worthy of the exceptional recognition which it has already received. Prof. Lejars has added to each of the seven successive editions of his book modifications of detail and of foundation, without which the work would cease to be progressive, up to date, and of service. All the chapters of the seventh edition have been reviewed, cut down and made more exact. The additions to our knowledge which the great war has made possible, relative to the treatment of visceral wounds, wounds of the soft parts, severe crushes, hemorrhages, treatment of fractures, have been incorporated. It is difficult to express in words the value of this remarkable book. Not only are the diagnostic symptoms, upon which may safely be based the indications for surgical interference, lucidly described in the text, but the technique is illustrated in an understandable manner. The experienced surgeon can take no exception to the methods chosen as among the best. The general practitioner, be he ever so limited in surgical experience, can safely follow the teachings of the book. Prof. Lejars says in his opening chapter:

Urgent surgery is done and ought to be done anywhere—in the operating room amongst the best surroundings; in the great centers, in the midst of riches; in the cottage; in the farmhouse. I have not insisted in this book that the model operating theater represents the indispensable complement of first aid. Outside of the hospital the situation is always more complex and more difficult, and for a prompt, urgent intervention to be done nicely and properly it is necessary to have an amount of practical knowledge, of initiative, of will, of which hospital surgery furnishes only an idea, often incomplete. This is true above all for the isolated practitioner, or the almost isolated physician of the village and of the country. It is not exactly the situation of the surgeon by profession, who is unaccustomed to being reduced to his own resources, much less accustomed to help himself than he is to be well assisted. It is in consideration of these circumstances that I have tried to place myself in recommending the indications for every practitioner to follow.

Before beginning the discussion of the urgent surgery which may be required in the different anatomical portions of the head, neck, trunk, and extremities, the author, in a brief but sufficiently long chapter, describes the necessary materials and their clinical uses in the preparation and carrying-out of an operation, the few instruments for a minor emergency, those essential for a more extensive one, how to bring about haemostasis, coaptation and dressing of wounds, anesthesia (general and local), artificial respiration, subcutaneous and intravenous serotherapy.

It is rather a bold statement, but the writer, from his own experience and reading, cannot recall a surgical emergency worthy of the name which will not be found so well described in this book but that any physician or surgeon of fair ability and equanimity can follow out the technique recommended. The important diagnostic signs pointing towards the urgency of surgical interference are as accurately described as present-day knowledge permits. Above all, procrastination, where action is essential for the relief of suffering or the saving of life, is frowned upon in a way that will appeal to the intelligence of every doctor. The writer has been familiar with Lejars' Surgery for many years and has always found it to contain more reliable information than any other book pretending to treat of the subject-matter of its title.

JOHN E. SUMMERS, M. D.

LES TUMEURS DU CERVEAU, par le Professeur Viggo Christiansen, médecin de l'Hôpital Royal de Danemark, correspondant de la Société de Neurologie de Paris, Traduit du danois par M. Polack, publié avec le concours du Dr. Henri Bouittier. Préface du Professeur Pierre Marie. 1. Vol. de 353 pages avec 105 figures (Masson et Cie, Editeurs). 25 fr. net.

The publishers in their foreword state that this clinical work treats of questions bordering between surgery and neurology and one need not only expect to find a monograph of bedside study and pathology of cerebral tumors, but he will find also the questions of early diagnosis and the justification of surgical intervention. As physician to the Royal Hospital of Denmark, which has furnished a vast field in which to study, Professor Christiansen brings out facts, the groups, the discussions, and conducts his lectures with a knowledge and appreciation of symptoms upon which a reasonable diagnosis may be supported.

The preface of this book, written by the distinguished French neurologist, Prof. Pierre Marie, could not be more complimentary as to the style in which the book is written nor as to the value of its contents. Among other things he says:

With great skill M. Christiansen presents to us each patient in such a way that it is not only a true sketch but a sketch in which all the essential facts are brought together in order to reproduce the clinical picture in a striking manner; the patients can be seen; in each of them all the diagnostic work can be followed, as also the discussions developing the reasons for intervention and its mode. It is with real interest that one understands finally the results of this intervention.

In no recent book on cerebral tumors of which the writer has knowledge will be found this question of the nervous system from a clinical and practical point of view, described in a manner so clear, so exact, so true to life. Symptomatology, pathological anatomy, evolution, diagnosis, indications for operation—all these questions are discussed.

The book is divided into twelve lectures: (1) Tumors of the Motor Region; (2), Tumors of the Motor Region (Monoplegia facial, brachial, crural. Symptoms of defects of sensibility); (3) Tumors of the Motor Region (Phenomena of motor irritation); (4) Tumors in the occipital lobes; (5) Tumors of the base of the brain (Migraine ophthalmoplegic—Myasthenia gravis pseudo-paralyticus); (6) Tumors of the base of the brain (Syphilitic basilar meningitis); (7) Tumors of the Hypophysis; (8), (9) Tumors of the pontocerebellar angle; (10) Cerebellar and intra-protuberance tumors; (11) Uncertain Diagnosis, (12) Surgical treatment of tumors of the brain.

Prof. Christiansen, a great admirer and follower of the French school of neurology, always so distinguished, writes his clinical pictures in such a way that it would seem that the patient was before one and the desired knowledge attained. The amount of clinical material used in illustration is sufficient for a proper comprehensive study of the different locations, so that a reasonably accurate diagnosis of cerebral tumors may be made. It is also sufficient to show the uncertainty of diagnosis in particular instances, and a warning against too great optimism in deciding the definite position or positions of certain tumors presenting unusual symptoms; all of this is well discussed in the chapter on Uncertain Diagnosis. When to operate and when not to operate is admirably considered in the chapter on surgical treatment, which is concluded by two tables: Table 1, Radical operations upon twenty-one tumors in the cerebral hemisphere, and Table 2, Radical operations upon eighteen tumors of the posterior fossa of the skull. These operations were performed by the several surgeons of the Royal Hospital of Denmark; in each instance the date of operation is given, the history of the case, condition of the pupil, symptoms of general compression of the brain, symptoms of paralysis, clinical diagnosis, verification at operation, verification at autopsy, and the functional result.

JOHN E. SUMMERS, M. D.

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